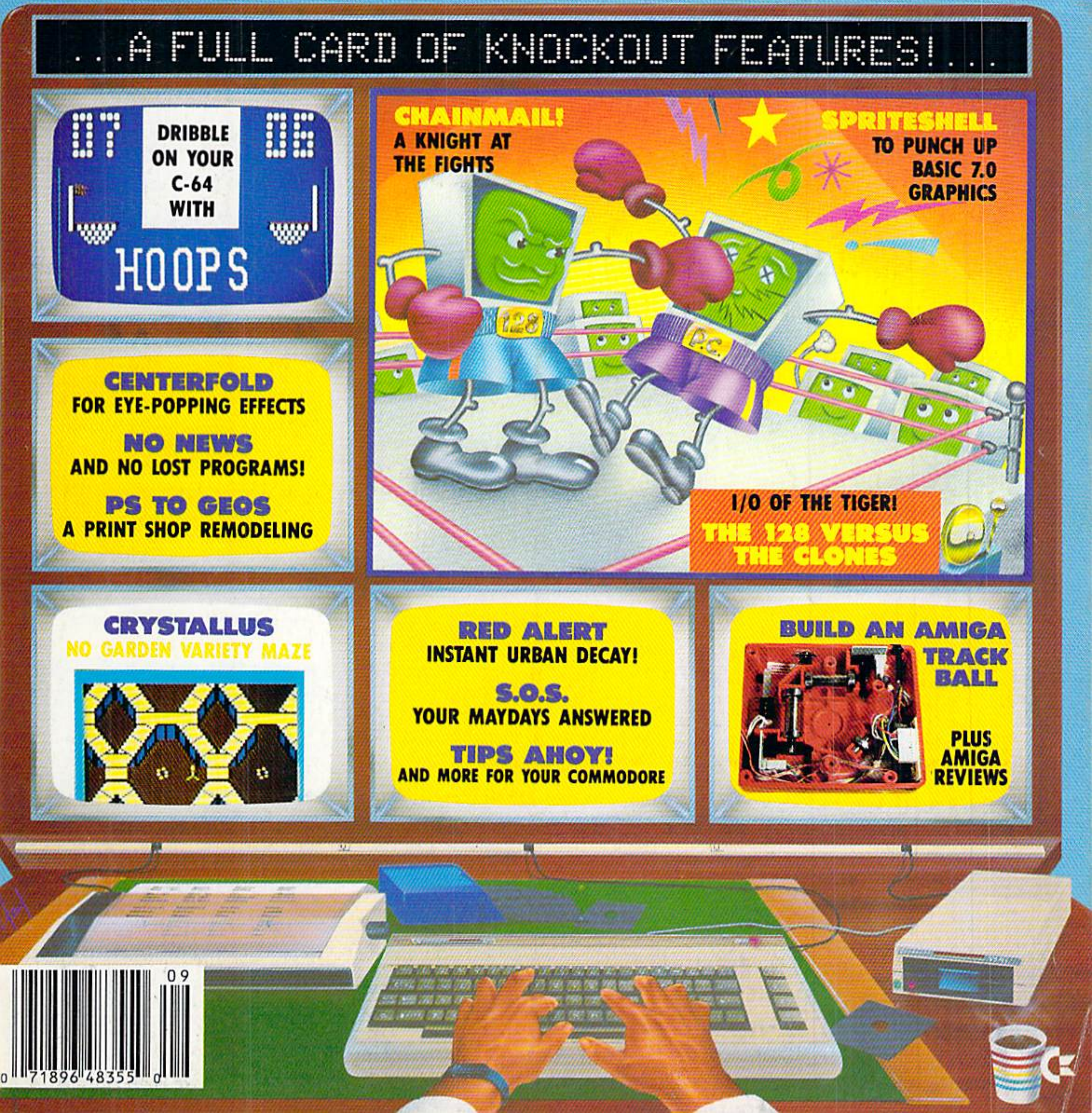
COMMODORE USERS

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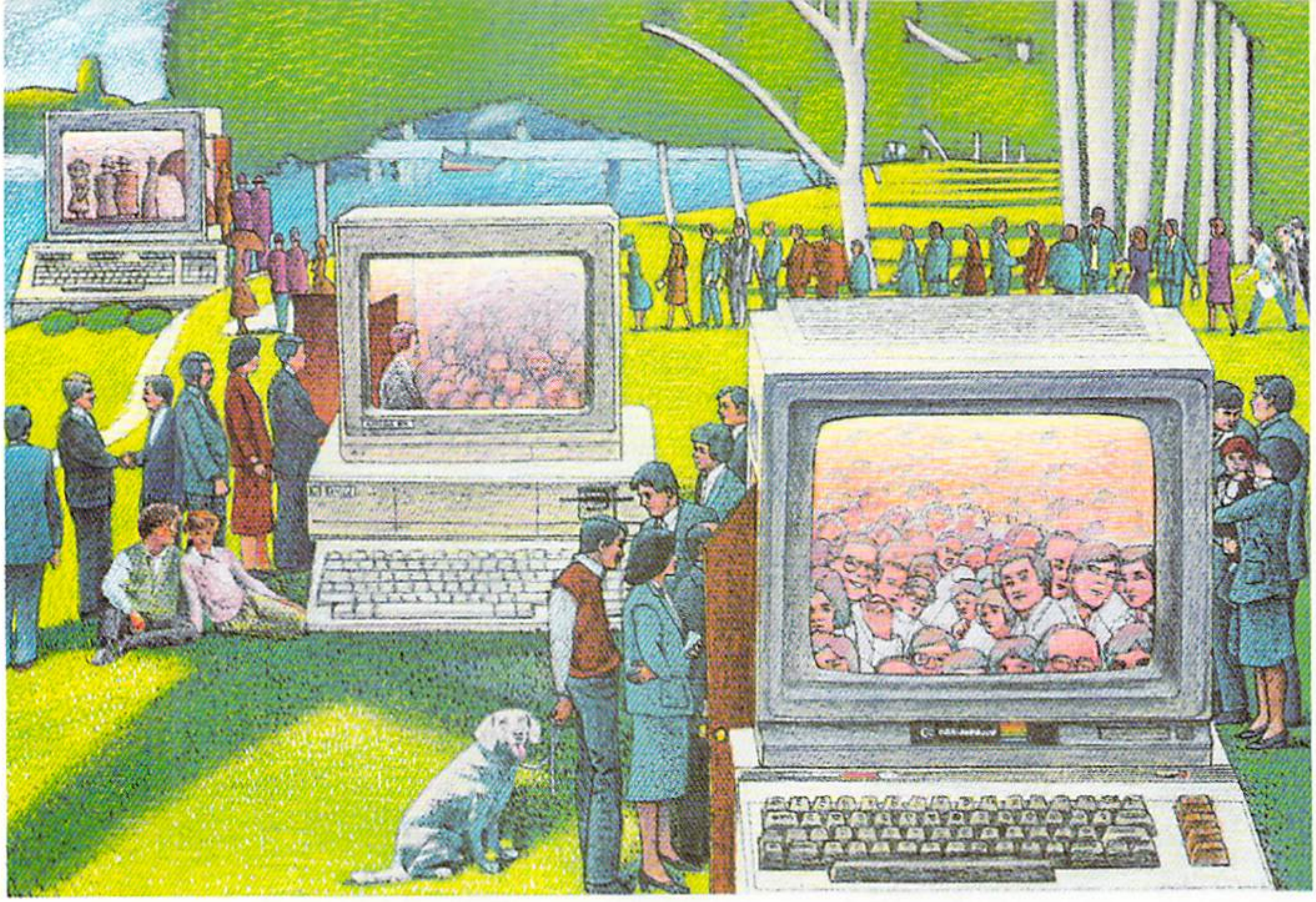
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THE COMMODORE USERS
Ahoy! Access
clipper
SEPTEMBER 1987

Ahoy! *Readers:*

Wow! I couldn't wait to write this letter to tell you about all the fantastic offers we have in store for you this issue. This issue the savings really add up. The best without question is ***S & S'*** *offer to sell any* ***Timeworks*** *C-128 program for $34.90. That's a SAVINGS OF 50%! But there's lots more.* ***The First Annual New York AmiEXPO*** *will be held October 10-12, 1987 at the Sheraton Centre Hotel. With the coupon on page 3 of this* Clipper, *you may SAVE $5 on the cost of attendance. And our friends at* ***Computer Mart*** *are offering a whopping 25% SAVINGS on their online help program called* The Live-In Reference Manual. ***Montgomery Grant*** *is also back with a FREE GAME DISK with any purchase over $100. And there's even more!*

If you took advantage of all of our offers this month, you could SAVE WELL OVER $50. Your subscription to Ahoy! *magazine truly pays for itself!*

Be sure to look for us in November, when we'll have more great offers to tempt you.

Admirally yours,

Joe Fergeson

Joe Fergeson
Director
Ahoy! *Access Club*

50% OFF SOLID WOOD COMPUTER DESK FROM PROTECTO...

Located in the heartland of America, Barrington, Illinois, **Protecto Enterprizes** was one of the pioneers in the computer discount mail order business. And the reasons that they continue to do so well are simple. They offer exceptional support and unusual guarantees. Their 15 DAY FREE TRIAL policy on products including software is very impressive.

Protecto knows that once you buy from them, you'll be likely to buy from them again. So they're making a fantastic offer on a valuable computer accessory, a beautiful, Solid Oak Computer Desk. Listing for $199, this solid wood desk is available to you as a member of the *Ahoy!* Access Club for only $99.95. You will need to add $15 for shipping and handling, and some assembly is required. But with almost 50% SAVINGS, this is surely one of the best offers we've ever featured. Just clip the **Protecto** coupon on page 3 of this *Clipper*, and send it along with your order. This offer expires October 30, 1987, so don't delay.

PAY FOR FOUR MONTHS, GET A FREE MODEM FROM QUANTUMLINK...

QuantumLink is one of the better subscriber services for features like on-line games, live conferences, software reviews, and user group support. Their advertisement in this month's issue of *Ahoy!* will tell you how you can receive a FREE **QUANTUMLINK** MEMBERSHIP KIT when you subscribe to *Ahoy!* (Since you're probably already a subscriber, you may take advantage of this offer by extending your subscription.) For *Ahoy!* Access Club members, **QuantumLink** is making an additional offer: Get FREE **QuantumLink** software, plus a FREE 300-baud, auto-dial modem by paying for four months of **QuantumLink** Basic Service ($9.95/month) at $39.80. You may order by clipping the **QuantumLink** coupon on page 3 of this *Clipper*, or by calling them at 1-800-392-8200, and asking for Department 25. This offer expires October 31, 1987, so mail or phone your order TODAY!

SAVE ALMOST 50% ON THE STAR MICRONICS NP-10 FROM LYCO COMPUTER...

If perchance you're in the market for a printer, read on. This issue **Lyco Computer** is offering one of the best printer values I've ever seen. With a 100 character per second draft mode, the Star Micronics NP-10 offers speed as well as fine near letter quality output. It offers a choice of friction or tractor feed, and has all the controls on the front panel. With an STD Parallel port, the Star Micronics NP-10 will require an additional interface. But unlike other printers with built-in interfaces, it is applicable to other equipment should you decide to upgrade. The suggested retail price is $249, and it's an excellent value at **Lyco**'s regular discounted price of $169. But for a limited time, you may buy this terrific printer from **Lyco Computer** for only $129.

In each issue of *Ahoy!*, you'll find two pages of great computer offerings from **Lyco Computer. Lyco** sells a wide variety of Commodore-compatible hardware and software at good prices. To get more details on shipping and handling for the Star Micronics NP-10 and applicable interfaces, check out **Lyco**'s ad in this month's issue of *Ahoy!* To order your Star Micronics NP-10 and cable or interface, just clip the **Lyco** coupon on page 3 of this *Clipper*. For more information on printers and interfaces, you may call them at 1-800-233-8760; in Pennsylvania, call 1-717-494-1030. They will accept phone orders on this offer, but you must mention your membership in the Club. This offer expires on October 15, 1987, so hurry and complete the **Lyco** coupon right away.

SUBSTANTIAL SAVINGS ON TIMEWORKS FOR THE 128 FROM S & S...

S & S Wholesalers has very good prices, perhaps the best you'll find anywhere on Commodore and Commodore-compatible hardware and software. Among the brand names of software sold by **S & S** is **Timeworks. Timeworks** has created some really terrific programs, including *Partner.* If you missed our enthusiastic review in the November '86 issue of *Ahoy!*, let me just say we liked it a lot. *Partner* puts some nifty accessories at your fingertips, like a Date Book and Appointment Calendar, Memo Pad, Address Book, Calculator, Envelope Addresser and Label Maker, Auto Dialer (an auto-dial modem is required, of course), and Screen Print. *Partner's* other features include SwiftLock and SwiftLoad, both very useful. The regular retail price of *Partner* is $69.95, but that's not what it will cost you....

S & S is anxious for you to consider buying from them when you're in the market for **Timeworks** products or any other programs, so they're making you this exciting offer: When you clip the **S & S** coupon on page 3 of this *Clipper,* you can purchase any **Timeworks** C-128 program for only $34.90. That represents OVER 50% SAVINGS on this excellent software! It's **S & S**'s way of motivating you to consider their good prices and excellent service. See their ad in this month's issue of *Ahoy!* You will need to add $4 for shipping and handling, if your order is under $100. You may also use your VISA or MasterCard, but you must add 3%. Because of some confusion in the past, they are not accepting phone orders. YOU MUST ENCLOSE THE **S & S** COUPON TO TAKE ADVANTAGE OF THIS FABULOUS OFFER! This offer expires on October 15, 1987, so mail your order RIGHT AWAY!

FREE GAME DISK WITH PURCHASE FROM MONTGOMERY GRANT...

If you haven't yet checked out the prices from **Montgomery Grant**, you'll surely want to do so. They have a wide variety of Commodore and Commodore-compatible peripherals and their prices are among the lowest in the country. Whether you're looking for a printer, a disk drive, or some other peripherals, **Montgomery Grant** is one of the suppliers you should definitely consider. When you're ready to buy from **Montgomery Grant**, be sure to use their 800 toll-free number, because besides having great prices, with every purchase over $100, **Montgomery Grant** will add a FREE GAME DISK. Read their ad in this month's issue of *Ahoy!* for details about ordering. They prefer that you place your order by phone. Just call 1-800-345-7059, or in New York, call 1-212-594-7140. And don't forget to ask for your FREE GAME DISK. If you prefer to place your order through the mail, simply clip the coupon on page 3 of this *Clipper.* This offer expires October 15th, so don't wait. Order TODAY!

25% SAVINGS ON THE LIVE-IN REFERENCE MANUAL FROM COMPUTER MART...

Computer Mart is relatively new to our *Ahoy! Clipper.* They have some excellent programs for sale, including *Kracker Jax*, their powerful parameter copy program. This month **Computer Mart** is featuring $5 OFF their great on-line help program called *The Live-In Reference Manual.* Regularly selling for $19.95, *The Live-In Reference Manual* has 17 screens of information, including ASCII characters, POKEs, color codes, selected DOS commands, BASIC keywords, abbreviations and token values, sound registers, musical notes in eight octaves, and much more! And even with all this help *The Live-In Reference Manual* uses almost none of the RAM for BASIC programming.

Computer Mart also has some other fine software worth looking at, so be sure to find their ad in this month's issue of *Ahoy!* Because **Computer Mart** wants you to give serious consideration to their *Live-In Reference Manual,* until October 15, 1987, you may take $5 OFF the cost of this valuable program. Just clip the **Computer Mart** coupon on page 3 of this *Clipper,* and send it with your order. This offer disappears October 15th, so don't wait.

SAVE $5 ON AmiEXPO...

Many of you have purchased or are considering purchasing Amigas. But even if you haven't thought about it before, you're sure to want to attend **The First Annual New York AmiEXPO.** Scheduled October 10-12, 1987, **The New York AmiEXPO** will be held at the Sheraton Centre Hotel. With 80 exhibitors and over 30 conferences and seminars, 10,000 persons are expected to attend from all over the eastern U.S. There will be keynote sessions by leaders in the field. **The New York AmiEXPO** promises to be the premier Commodore event for the East Coast this year. The regular prices for one, two, or three days of attendance with advance registration are $10, $15 and $20, respectively. At the door, all tickets will cost $5 more and registration is likely to be very crowded, so when you mail in your advance registration, you'll save time and money. For more information, call 1-800-32-AMIGA, or in New York State, call 1-212-867-4663. When you call this number, they'll send you registration forms to register in advance. Thanks to the generosity of **AmiEXPO,** you may SAVE an additional $5, by enclosing the **AmiEXPO** coupon on page 3 of this *Clipper.* You may also use the coupon at the door, but obviously, you'll save $5 more when you register by mail. Other events are planned for Los Angeles and Chicago, so keep watching your *Clipper* for further developments.

10% OFF WORLD CLASS LEADER BOARD FROM ACCESS SOFTWARE...

Access Software is a leader in the field of pro golf simulators. They built their reputation with *Leader Board,* then *Tournament Disk #1,* and finally *Executive Disk #1.* **Access Software** now presents their latest and greatest pro golf simulator, *World Class Leader Board.* It includes three of the most famous 18-hole golf courses: St. Andrews, Scotland, the most revered course in golf; The Doral Country Club, the Florida Blue Monster; and Cypress Creek, Texas, the largest and finest golf course in the U.S. *World Class Leader Board* features authentic reproductions of these actual courses with trees, traps, ruff, and water hazards. The 4th course included is The Gauntlet Country Club. Only those who have mastered the best courses in the world can expect to come close to par on the Gauntlet.

World Class Leader Board features a scorecard printout, aerial views, a course editor (to arrange the holes in any order you choose), a practice putting green, and a driving range. There are thousands of trees, up to 192 per hole. In addition, the improved graphics and playability increase difficulty and realism.

My whole family had a wonderful time playing *World Class Leader Board*, and so will you. With a suggested retail price of $39.95, *World Class Leader Board* will challenge you with the same strategy and option decisions you face in a real game. And because the look and feel are so likelike, it may improve your actual game as well.

Now and for a limited time, you may SAVE 10% on *World Class Leader Board*, when you order it directly from **Access Software.** Use the handy **Access Software** coupon on page 3 of this *Clipper,* or you may call them at 1-801-298-9077 (Please do not use their toll-free number!). Don't forget to mention you saw this offer in the *Ahoy! Clipper,* so that you get your discount. This offer expires on October 15th, 1987, so hurry and place your order RIGHT NOW!

The Ahoy! Access Clipper *is published bimonthly by* Ahoy! *magazine and sent free to selected subscribers of* Ahoy! Ahoy! *is a monthly publication of Ion International Inc. The cost of a one-year subscription is $23.00; two years are $44.00. Inquiries regarding subscriptions to the magazine should be addressed to Ion International Inc., 45 West 34th Street, New York, New York 10001.*

SAVE UP TO 50% ON TIMEWORKS FROM S & S

Mail to: S & S Wholesalers
226 Lincoln Road
Miami Beach, FL 33139
NO PHONE ORDERS, PLEASE!

YES, **S & S**, I want to purchase **Timeworks** programs for the C-128 at $34.90 each. I understand this represents an OVER 50% SAVINGS from the regular retail price of some programs. If my order is under $100, I'm adding $4 for shipping and handling. Thanks! FOR VISA OR MASTERCARD PURCHASE, ADD 3%.

Name on Credit Card____________________

Credit Card #____________Exp. Date________

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SAVE $5 ON AmiEXPO

FOR REGISTRATION FORMS, FIRST CALL 1-800-32-AMIGA, OR IN NEW YORK STATE CALL 1-212-867-4663, THEN SEND THIS COUPON WITH THAT FORM.

Mail to: The First Annual New York AmiEXPO
211 East 43rd Street, Suite 301
New York, NY 10017

YES, **AmiEXPO**, I want to SAVE $5 on attendance to your First Annual New York AmiEXPO to be held October 10-12, 1987 at the Sheraton Centre in New York City. I understand that only with this coupon may I SAVE $5. If my payment is not enclosed, I may still SAVE $5 at the door, but the cost is also $5 more.

Days	Advance Registration	At the Door
1	$5 (with coupon)	$10 (with coupon)
2	$10 (with coupon)	$15 (with coupon)
3	$15 (with coupon)	$20 (with coupon)

SAVE ALMOST 50% ON THE STAR MICRONICS NP-10 PRINTER FROM LYCO COMPUTER

Mail to: Lyco Computer
P.O. Box 5088
Jersey Shore, PA 17740
For faster service, call 1-800-233-8760.
In PA, call 1-717-494-1030.

YES, **Lyco**, I want to buy the Star Micronics NP-10 Printer. My order for the printer (and applicable cable or interface if desired) is enclosed. CREDIT CARD ORDERS: PLEASE ADD 4%.

Name on Credit Card____________________

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FREE GAME DISK WITH $100 PURCHASE FROM MONTGOMERY GRANT

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In NY, call 1-212-594-7140.

YES, **Montgomery Grant**, I want to get my FREE GAME DISK. Enclosed is my order for $100 or more. I have checked your ad for the details about ordering. Thanks!

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10% OFF WORLD CLASS LEADER BOARD FROM ACCESS SOFTWARE

Mail to: Access Software
2561 South 1560 West
Woods Cross, UT 84087

For faster service, call 1-801-298-8077.
VISA and MasterCard accepted.

YES, **Access Software**, I want to SAVE 10% on your excellent pro golf simulator, World Class Leader Board. My payment of $35.95 plus $1 for shipping and handling is enclosed. Thanks!

SAVE 50% ON SOLID OAK COMPUTER DESK FROM PROTECTO ENTERPRIZES

Mail to: Protecto Enterprizes
22292 Pepper Road
Barrington, IL 60010

For information, call 1-312-382-5244.
NO PHONE ORDERS, PLEASE!

YES, **Protecto**, I want to SAVE almost 50% on your Solid Oak Computer Desk. Enclosed is my payment of $114.95, representing $99.95 for the computer desk and $15 for shipping and handling. Thanks!

FREE MODEM AND SOFTWARE FROM QUANTUMLINK

Mail to: QuantumLink Computer Services
8620 Westwood Center Drive
Vienna, VA 22180
For faster service, call 1-800-392-8200, Dept. 25.

YES, **QuantumLink**, I want to get my FREE MODEM AND SOFTWARE by paying now for four months of **QuantumLink** Basic Service ($9.95/month). My payment of $39.80 is enclosed. Thanks!

$5 OFF THE LIVE-IN REFERENCE MANUAL FROM COMPUTER MART

Mail to: Computer Mart
2700 NE Andresen Road
Vancouver, WA 98661

YES, **Computer Mart**, I want to SAVE $5 off the regular price of $19.95 on *The Live-In Reference Manual*. My order is enclosed. Thanks for my 25% SAVINGS!

Name on Credit Card____________________

Credit Card #____________Exp. Date________

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Ahoy!

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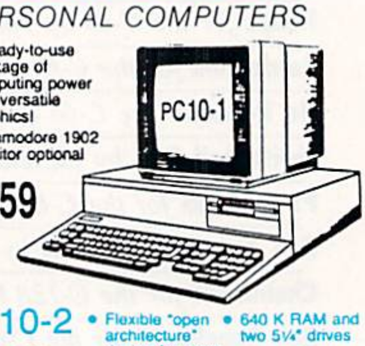
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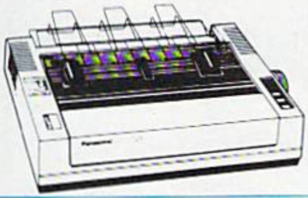
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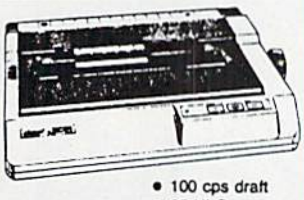
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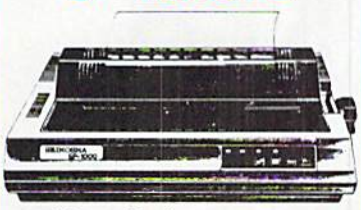
DISKETTES

Box of 10

	5¼	3.5
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DSDD	$9.99	$17.99
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SSDD	$6.99	—
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Panasonic:	
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NEC:	
Multisync	$CALL

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$699 (reg. $1009.85)



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- Commodore 128 Computer
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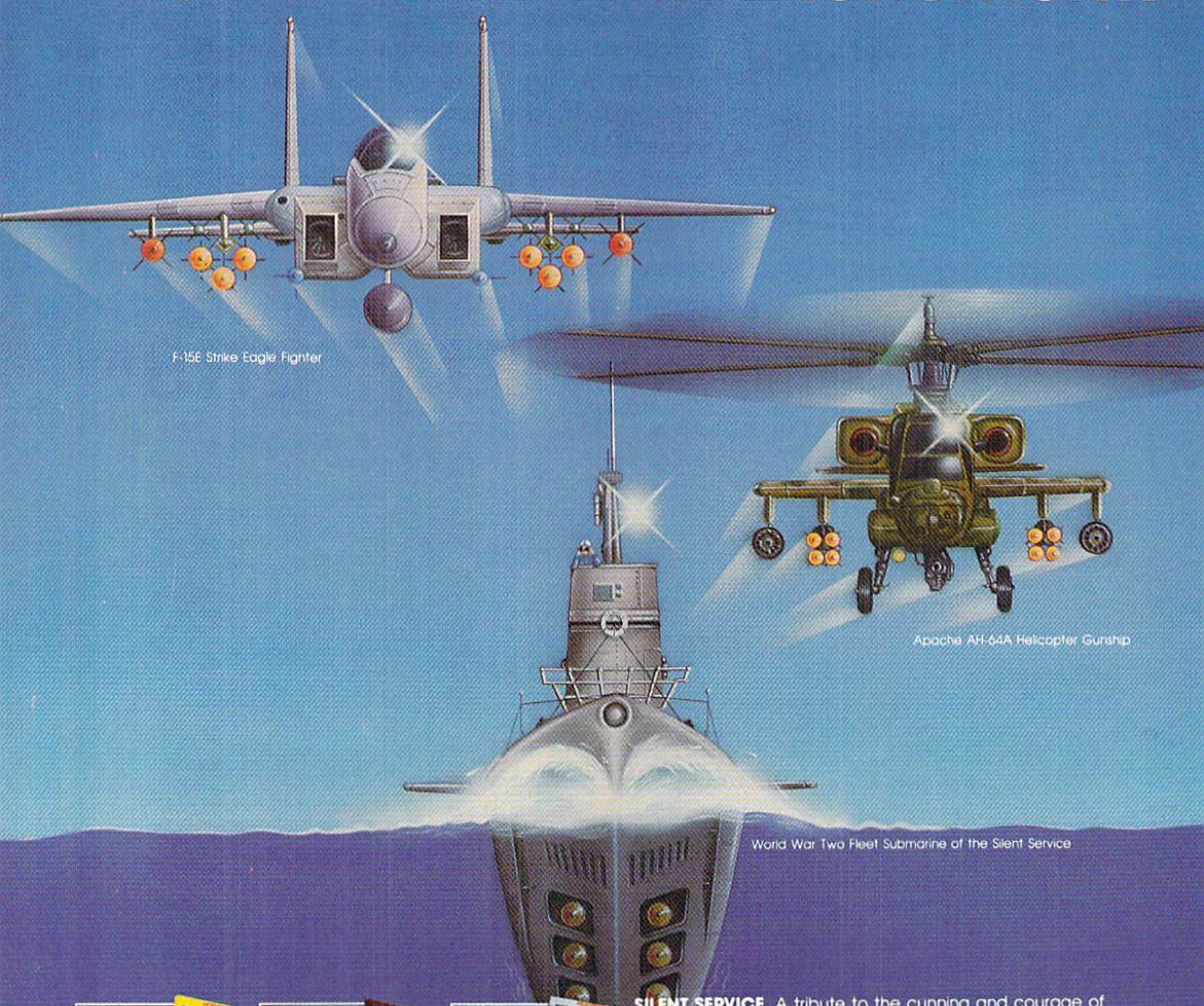
commodore HARDWARE

1802C Monitor	$189	C128 Computer	$249
C1700 RAM	$109	1571 Drive	$225
C1750 RAM	$169	1902 Monitor	$285
C1351 Mouse	$39	64C Computer	$175
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VIEW FROM THE BRIDGE

We've said it before, but this month it especially bears repeating: *Ahoy!* is not a closed shop. Though this issue features programs from regulars Bob Blackmer, Shawn K. Smith, and two apiece from Cleveland M. Blakemore, Tony Brantner, and Buck Childress, the many other talented individuals who regularly submit work should not consider themselves at a competitive disadvantage. We have no staff programmers–all programs are written freelance, and none of these freelancers has a designated slot to fill each month or any month. The same authors keep appearing because they keep providing the best programs. Equal their work, and you'll have an equal chance. Top it, and we'll be writing about you instead one of these months.

As for this month, *Ahoy!'s* programmers, columnists, and reviewers have turned in a job at least as difficult to surpass as usual:

• The C-128 always seemed like the industry's biggest steal...at least, until Far East ingenuity made it possible to own a generic IBM PC for under $500. Does the 128 remain the better buy? This month's *Rupert Report* tells you what happened when we put *The 128 versus The Clones*. (Turn to page 32.)

• The 128's built-in sprite editor makes designing the little devils easy...but manipulating them can still be a migraine and a half. So Cleve Blakemore wrote *Spriteshell 128* to endow you with a greater degree of control. (Turn to page 48.)

• With *Spriteshell* in place, maybe you'll be able to create C-128 games as good as Cleve's *Chainmail!* This life and death duel between the Crimson and Green Knights is done to the hilt. (Turn to page 70.)

• After the massive success of *Wizard Tag II,* Bob Blackmer wasted no time designing another challenge for his many fans. On the other hand, after reading some of the smart aleck letters Bob received (see *Flotsam*, page 68), we wonder–did Bob intend to entertain his fans, or lose them in the 36 interconnecting cubicles of *Crystallus*? (Turn to page 16.)

• Are you tired of coming up with new methods of destroying a program in memory? So was Buck Childress. He gives 64 and 128 users protection against some of the most common causes of death in *No News*. (Turn to page 30.)

• We can't promise that Buck's *Centerfold* will make your title screens as appealing as the centerfolds of some other magazines we could name. But it's the best we can do in a family magazine. (Turn to page 22.)

• He's brought auto racing, boxing, bowling, and horse racing to life in these pages...and now Tony Brantner hits from 20 with *Hoops!* (Turn to page 18.)

• Afraid of running out of sports, Tony cribbed from the classics for his second program this month. *Red Alert* involves a *Missile Command*-like defense of a sextet of cities. (Turn to page 60.)

• Barnum and Bailey...Eastman and Kodak...peanut butter and chocolate...when giants in any field merge, the union seems larger than the sum of its parts. It's happened again with Shawn K. Smith's *PS to GEOS*, permitting commerce between two of the most popular programs in Commodore history. (Turn to page 51.)

• If you own an Amiga but not its attendant rodent, you'll be glad that you never threw away that old C-64 trackball–because Morton Kevelson is going to show you how to turn it into a mouse. And once you're happily *Rolling Your Own,* you can read the reviews also included in this month's *Amiga Section,* on *Space Quest, Disk-2-Disk,* and *Butcher.* (Turn to page 53.)

• Now that it's no longer being produced, we tend to forget how good the MSD SD-2 was. But Computer Mart hasn't–they're distributing three new products in support of the landmark dual drive, all of which are covered in this month's *Reviews* section. (Turn to page 63.)

As space on this page runs out, we'll hastily direct you towards *Scuttlebutt,* beginning on the following page and detailing significant software and hardware announcements from this June's Consumer Electronics Show. Richard Herring's *COMAL Column* was cut from this issue for space considerations, but will be present next month–along with a lot more. As winter approaches, we're only going to get bigger and better!

–David Allikas

SCUTTLEBUTT

ONLINE CASINO GAMES • RECIPE DATABASE • 64 REPLACEMENT CASE • DESKTOP PUBLISHING • 64 & AMIGA NETWORKING • LIGHT PENS • GRAPHICS EXCHANGE • PRINTERS • GAMES FROM MICROPROSE, EA, ACTIVISION, FIREBIRD • TYPING TUTORS • CALENDAR MAKER • COMPUTER LEARNING MONTH

NEWS FROM CES

As usual, June's Summer 1987 Consumer Electronics Show has yielded a huge amount of prerelease information on Commodore-compatible products, most of which we're passing along to you in this edition of *Scuttlebutt*. Only two generalizations could be made: compared to recent shows, this one was light on hardware and heavy on game software; and the Amiga has clearly continued to gain software support. Unless specified otherwise, the products listed below are scheduled to be in computer stores by the time these words reach you, or shortly thereafter.

DESKTOP PUBLISHING

The newest addition to the home computing lexicon: WYSIWYG. An acronym for "what you see is what you get," the term refers to the style of word processing required for desktop publishing, where you lay out your newsletter or document page onscreen. WYSIWYG with these three new entries, two for the 64 and one for the Amiga:

The *Timeworks Desktop Publisher* for the 64 offers typesetting features like kerning, italicizing, and underlining, page design capabilities like definition of margins and column width, drawing tools that utilize built-in patterns or your own, and the ability to import illustrations from leading graphics packages. Price to be announced.

Timeworks, 312-948-9200 (see address list, page 12).

geoPublish ($59.00) provides *GEOS* users with multicolumn formats, multiple fonts, styles, and point sizes, integrated graphics that can be cropped, centered, or scaled to fit, and full page and "zoom" previews.

Berkeley Softworks, 415-644-0883 (see address list, page 12).

Vizawrite ($149.95) lets Amiga owners transport images from most "Paint" programs into documents, then move and resize them via the mouse. Text is automatically set into pages, and documents retain information like author, creation date, and alteration count when saved. A glossary feature permits the insertion of frequently used phrases with one keystroke. Also included is a mailmerge facility.



Build a newspaper or magazine empire.
READER SERVICE NO. 214

Progressive Peripherals & Software, 303-825-4144 (see address list, page 12).

ALONE FOR THE FIRST TIME

Two light pens from Inkwell Systems: the new model 184-C ($59.95) featuring a lightweight tri-lobular body and two touch-sensitive switches, and the industrial quality 170-C ($99.95), an upgraded version of the model that until now was available exclusively with the *Flexidraw* graphics program. Improvements to the latter include nosetip actuated switch, enhanced circuitry, new case design, and a two-year warranty.

Both pens are plug compatible with the Commodore 64 and the Amiga, are designed for single pixel resolution on monochrome or color CRT's, and can be used with a variety of software programs including *Flexidraw, Flexifont, Graphics Integrator 2, CADPAK 64* and *128, GEOS,* and *T.H.I.S.* Included with each is a technical manual and a C-64 demo program.

Additionally, *Flexidraw* has been made available for the first time without its light pen. *5.5,* the latest version, includes data entry device support for the Koala Pad and the Commodore mouse and joysticks. Price is $34.95.

Inkwell Systems, 619-268-8792 (see address list, page 12).

FOR GHOST WRITING?

The *Spirit-Writer* word processor ($29.95) includes a 30,000 word spell checker (expandable to 40,000 words). Onscreen editing, justification, page numbering, variable fonts, line spacing, and other functions are supported. A single file can be up to 450 lines long. Shipping is free.

Free Spirit Software, Inc., 312-352-7323 (see address list, page 12).

TYPING PROGRAMS

Four new typing programs for the 64 and/or Amiga:

Typing Tutor IV ($39.95) offers such enhancements over version III as a goals questionnaire that allows the program to tailor lessons and tests to your level, an instructor mode for classroom or corporate training, a Natural Language Generator that constructs words and phrases out of letters being learned, multiple standard speed tests, and a Letter Invaders game with improved graphic and sound.

Simon and Schuster, 212-373-8882 (see address list, page 12).

Type! ($39.95) offers practice with real words and sentences, rather than random-letter drills. The program's diagnostics will display graphics and printouts of performance, and recommend exercises to improve speed and accuracy. Also included is Type!-Athlon, an arcade-style game.

Broderbund Software, Inc., 415-479-1700 (see address list, page 12).

Not one but two typing programs from EA:

Mavis Beacon Teaches Typing draws its lessons from a database of over 1000 passages from history's greatest writings (for youngsters, it's jokes, riddles, rhymes, and listings from The Guinness Book of World Records). Mavis "speaks" to her students in complete sentences as she analyzes typing errors and progress. Animated hands type in real time along with the student on a detailed onscreen keyboard. $39.95 for the 64, $44.95 for the Amiga.

Designed for adults, *IntelliType* ($49.95) for the Amiga uses artificial intelligence and an adventure story to teach typing in 30 days. Each lesson offers the conclusion to the previous episode's cliffhanger ending. Students can learn to touch type or improve their current skills with thirty lessons.

Electronic Arts, 415-571-7171 (see address list, page 12).

TV DINNERS

The Great Chefs features the entire collection of recipes from the "Great Tastes of the Southwest" TV series that began airing on PBS in June 1987, plus recipes from previous aired segments. Each of the three volumes contains about 100 recipes, cooking tips and biographical information from the chefs, and menu planning and printer driving software. Volumes 1, 2, and 3 are $24.95 each, or $65.00 for the set.

Concept Development Associates, Inc., 904-825-0220 (see address list, page 12).

C-64 & AMIGA NETWORKING

geoNET will allow C-64 and 128 computers to be networked with an IBM PC, with the latter serving as a file and print server and each workstation consisting of a C-64, a monitor, and the *geoNET* interface card which contains a 512K RAM disk, the network I/Q hardware, and firmware to allow booting of the network. Each of the workstations can be monitored from the PC, and files easily transferred to and from the PC's hard disk. No price had been set at press time.

Berkeley Softworks, 415-644-0883 (see address list, page 12).

C Ltd has placed in the public domain a preliminary version of its SCSI-based Local Area Network, which makes it possible to connect several Amigas to a single mass storage device (hard drive, CD ROM, etc.). The complete system now being developed will connect Amigas to laser printers, WORM systems, and more. But the file server is available now on CompuServe in the Amiga Forum area (data library #DL-11 Search: "Multi-user).

C Ltd (see address list, page 12).

CompuServe, 614-457-8600 (see address list, page 12).

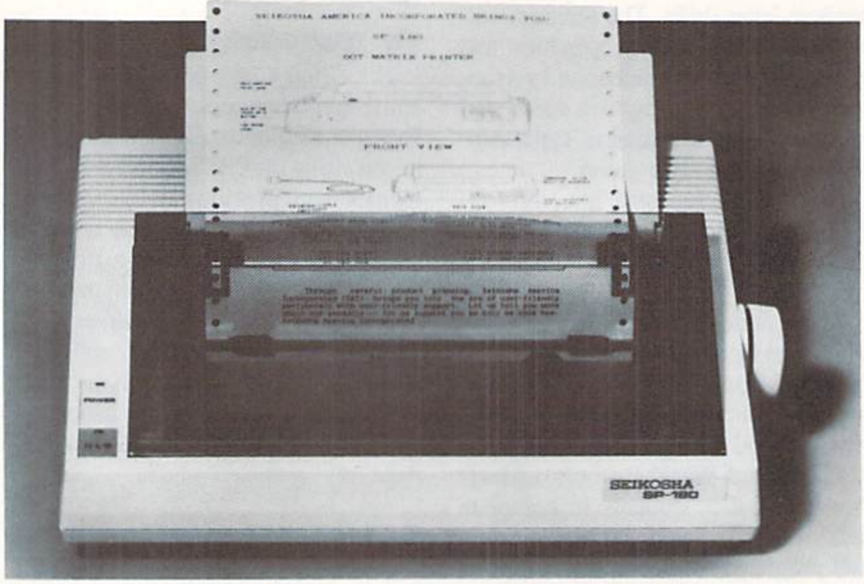
TOY SHOP REDUCED

Broderbund has lowered the price of the C-64 version of *The Toy Shop* from $59.95 to $39.95, and that of the refill kit from $24.95 to $19.95.

Broderbund Software, Inc., 415-479-1700 (see address list, page 12).

COMPUTER LEARNING MONTH

October 1987 has been designated Computer Learning Month by a coalition of leaders in the computer and education fields, among them Apple and



The Seikosha SP-180VC is designed specifically for the computer novice, with simple operation and streamlined design. READER SERVICE NO. 216

IBM. The national nonprofit campaign will target the nation's schools, encouraging students, educators, parents, and community leaders to explore the potential of computers as learning tools. Planned activities include national student and teacher contests in computer-generated and computer-themed art, essays, and open-ended creative projects. Teachers may submit innovative lesson plans that use the computer to enhance learning. Prizes include Apple workstations and packages donated by software publishers. Deadline for entry is October 22.

Computer Learning Month, 202-223-4338 (see address list, page 12).

SLIMLINE 64

GEOS software notwithstanding, a 64C is practically worth the extra cost for the cosmetic improvement alone. Of course, love is blind, and many owners of standard 64's adore the computer's looks. But for the rest of us 64 owners who would almost prefer to type with the dust cover still on, a facelift is now available. Previously offered in Europe, the Slim Line 64 Replacement Case ($34.95) offers the overall appearance of a 64C, including the lower profile and key height. The transformation requires 10 minutes and a Philips screwdriver.

Grapevine Data Products, 902-892-6372 (see address list, page 12).

NEW PRINTERS

The Commodore-compatible Okidata 180 printer ($329) sports a pushbutton panel on the front that provides access to the most frequently used commands, including selection of pitch and print mode (NLQ, utility, or high speed modes, printing at 30, 120, and 180 characters per second respectively). A 2K buffer is standard.

Okidata, 609-235-2600 (see address list, page 12).

Featuring simple operation tailored to the computer novice, Seikosha's SP-180VC printer ($249) outputs at 100 characters per second in draft mode and 20 in NLQ. Included are 129 characters and 68 graphic elements.

Seikosha America Inc., 201-529-4655 (see address list, page 12).

GRAPHICS INTERCHANGE

CompuServe's new Graphics Interchange Format will permit Amiga users to exchange high-resolution graphic images with Macintosh, Atari ST, and IBM PC owners. Typical uses will be the transfer of technical design diagrams, business charts and graphs, medical illustrations, computer art, and digitized photographs. Besides solving hardware incompatibility problems, GIF will compress images to reduce the file size needed by ½ to ⅛, thus reducing transmission costs. Images can contain up to 256 simultaneous colors. The GIF program and sample files are available through the Amiga hardware forum on CompuServe.

CompuServe, 614-457-8600 (see address list, page 12).

SUPER GRAPHIX GOLD

Super Graphix Gold ($119.95) outperforms Xetec's pre-Gold interface with a 32K buffer, 8 switch-selectable operating modes, 32 printer choices, 16 active DIP switches, RESET and CLEAR buttons, LEDs to indicate activity and errors, direct-from-disk downloads and dumps, 21 secondary addresses, 12 printing channels, command channel with over 35 commands, banner channel, 4 new channels for downloading and printing fonts, pictures, and directories, and 2 built-in screen dumps with 16 sizes and 4 shades. There are 4 built-in and 4 downloadable fonts, all supporting underlining, italicizing, boldfacing, super/



The Okidata 180 offers pushbutton control of line/form feeds, print mode and pitch selection, etc. on its front panel. READER SERVICE NO. 217

subscribing and 9 pitches.

Xetec, Inc., 913-827-0685 (see address list, page 12).

Q-LINK CASINO GAMES

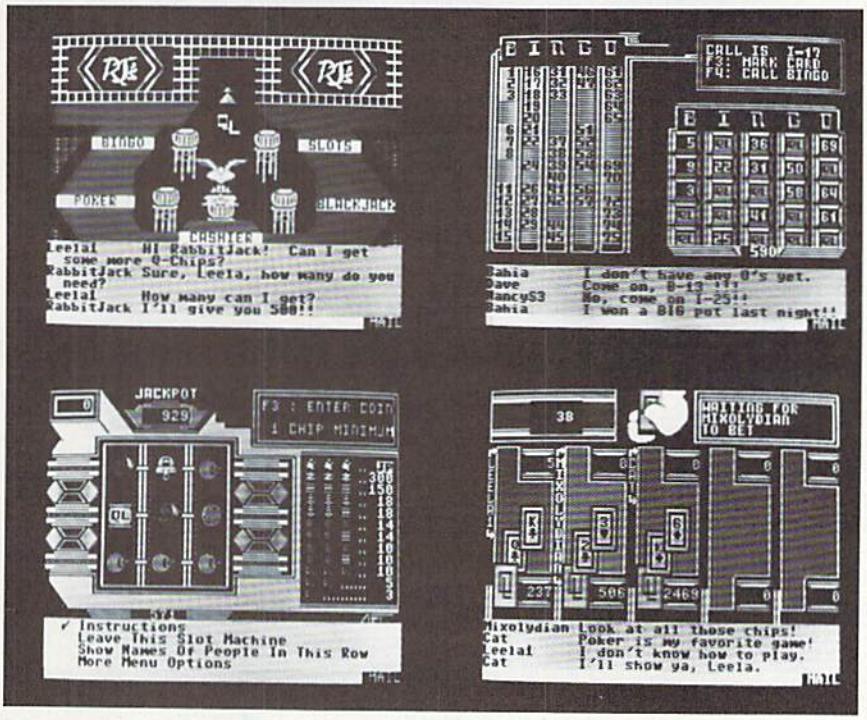
Rabbit Jack's Casino Games will allow QuantumLink subscribers to compete against one another in an online casino in Bingo, Blackjack, Poker, and Slot Machines. Players can raise their opponents in Poker, double down in Blackjack, play full-card Bingo, and bet on three lines in Slot Machines while chatting with their opponents. All four games are packaged on a disk that costs $14.95; the usual service fee of 6¢ per minute is charged to players.

Quantum Computer Services, 703-448-8700 (see address list, page 12).

ging by changing weather conditions and the unique properties of the barques, loops, frigates, and galleons of the era.

Project: Stealth Fighter ($39.95) features an advanced cockpit with two multipurpose display screens, radar scope, and 3-D out-the-window viewing with a superimposed "heads-up" display. The pilot must maintain a low electromagnetic profile and use the latest in armament and reconnaissance technology while manipulating more than 30 separate controls.

Uncharacteristically for a MicroProse game, *Airborne Ranger* ($34.95) involves neither a plane, helicopter, or submarine. Instead it parachutes the player into enemy territory where he



QuantumLink subscribers will be awarded chips for playing Rabbit Jack's Casino Games *whenever they sign on.* *READER SERVICE NO. 218*

GAMES

For the C-64 from MicroProse:

Billed as the first adventure/simulation, *Pirates!* ($39.95) takes place in the taverns of exotic ports, in the mansions of governors, and on the open seas of the Spanish Main. The game engages players in simulated sword fights, ship to ship duels, and land battles in their roles as English, French, Dutch, or Spanish buccaneers trying to seize fortune and build their reputations. Sailing is made more challen-

must outmaneuver and outperform hostile troops on patrol or hidden in bunkers, machine gun nests, and armored cars. The joystick-controlled soldier evades the enemy across a 3-D terrain, crawling or running through ditches and ravines, armed with a submachine gun and grenades.

MicroProse Simulation Software, 301-771-1151 (see address list, page 12).

The C-64 adaptation of *Blue Powder Grey Smoke* ($49.95) attempts to combine elements of an action simulation with the depth of a wargame. A

zoom-in feature permits closeup combat display.

Garde Games of Distinction, 203-245-9089 (see address list, below).

The *NBA* ($39.95) statistical basketball game lets C-64 coaches combine players of the past and present as they select lineups, make substitutions, and call plays. 20 teams are included, ranging from the '59-'60 Celtics to the four top teams of the '85-'86 season. An animation feature allows plays to be re-enacted by all 10 players, and a statkeeper program updates players' performances throughout the game. A selection of accessory disks will be made available.

The Avalon Hill Game Company, 301-254-9200 (see address list, below).

New from Activision:

The comedy-adventure *Maniac Mansion* ($34.95) contains 55 3-D rooms and areas full of mental challenges. More than 450 objects can be manipulated by the player to solve mysteries. At least five successful endings are possible.



No soreheads we—here's Activision's The Last Ninja *in extra large size, even though we* were *first with the title.* *READER SERVICE NO. 219*

As *The Last Ninja* ($34.95), you must retrieve the sacred scrolls of the White Ninja which a power-hungry shogun has stolen and brought to his island stronghold. You'll advance through six levels of difficulty across

Companies Mentioned in Scuttlebutt

Activision, Inc.
2350 Bayshore Parkway
Mountain View, CA 94043
Phone: 415-960-0410

Berkeley Softworks
2150 Shattuck Avenue
Berkeley, CA 94704
Phone: 415-644-0883

Broderbund Software, Inc.
17 Paul Drive
San Rafael, CA 94903-2101
Phone: 415-479-1170

C Ltd
723 East Skinner
Wichita, KS 67211
Phone: 316-267-6321

CompuServe
5000 Arlington Centre Blvd.
Columbus, OH 43220
Phone: 614-457-8600

Computer Learning Month
P.O. Box 19763
Washington, D.C. 20036-0763
Phone: 202-223-4338

Concept Development Assoc.
45 Cordova Street
St. Augustine, FL 32084
Phone: 904-825-0220

Electronic Arts
1820 Gateway Drive
San Mateo, CA 94404
Phone: 415-571-7171

Epyx, Inc.
600 Galveston Drive
Redwood City, CA 94063
Phone: 415-366-0606

Eurosoft International
114 East Avenue
Norwalk, CT 06851
Phone: 203-838-9890

Firebird
P.O. Box 49
Ramsey, NJ 07446

Free Spirit Software, Inc.
538 S. Edgewood
LaGrange, IL 60525
Phone: 312-352-7323

Garde Games of Distinction
8 Bishop Lane
Madison, CT 06443
Phone: 203-245-9089

Grapevine Data Products
P.O. Box 1886
Charlottetown, P.E.I.
Canada C1A 7N5
Phone: 902-892-6372

Inkwell Systems
P.O. Box 85152 MB290
5710 Ruffin Road
San Diego, CA 92138
Phone: 619-268-8792

MicroProse Software
120 Lakefront Drive
Hunt Valley, MD 21030
Phone: 301-771-1151

Okidata
532 Fellowship Road
Mt. Laurel, NJ 08054
Phone: 609-235-2600

Progressive Peripherals
464 Kalamath Street
Denver, CO 80204
Phone: 303-825-4144

QuantumLink
8620 Westwood Center Drive
Vienna, VA 22180
Phone: 800-392-8200

Seikosha America Inc.
1111 Macarthur Blvd.
Mahwah, NJ 07430
Phone: 201-529-4655

ShareData
7400 W. Detroit Street
Chandler, AZ 85226
Phone: 602-961-7519

Simon & Schuster
One Gulf+Western Plaza
New York, NY 10023
Phone: 212-333-3397

The Avalon Hill Game Co.
4517 Harford Road
Baltimore, MD 21214
Phone: 301-254-9200

Timeworks
444 Lake Cook Road
Deerfield, IL 60015
Phone: 312-948-9200

Xetec, Inc.
2804 Arnold Road
Salina, KS 67401
Phone: 913-827-0685

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Basic 64	25.75
Cadpak 128	38.95
Cadpak 64	25.95
Chartpak 128	25.95
Chartpak 64	25.95
Cobol 64	25.95
Cobol 128	37.95
Speed Term	25.95
Super C Compiler 64/128	38.95
Super Pascal	48.95

BRODERBUND

Where in the World is Carmen Sandiago	$21.95
P/S Library 1-2-3 ea	15.95
Print Shop	26.95
Print Shop Companion	21.95
Toy Shop	39.95
P/S Holiday Library	15.95

MICROLEAGUE

Box Score/Stat Compiler	$16.95
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Micro League Baseball	24.95
Team Disks	16.95

RIBBON

(Min. 6 per order)

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Commodore 1526	6.95
Epson 185	6.95
Epson 85	4.95
Epson mx, fx, rx 100	6.95
Epson mx, fx, rx 80	4.95
Gorilla Banana	6.95
Juki 6000	4.95
Juki 6100	3.95
Legend 880, 1080, 808	6.95
MPS 801	6.95
MPS 803	6.95
OKI 182, 192	7.95
OKI 82, 92, 83, 93	2.25
SG 10-15	2.25
Panasonic 1081, 1091	8.95

INFOCOM

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Hitchhiker's Guide	21.95
Hollywood Hijinx	21.95
Invisiclues ea	6.00
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Zork 1-2-3 ea	25.95
Sorcerer	24.95

DATAEAST

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GAMESTAR

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Superscript 128	47.95
Superscript 64	46.95

TIMEWORKS

Data Manager 128	$42.95
Data Manager II	29.95
Partner 128	42.95
Swift Calc 128 w/Sideways	42.95
Swift Calc 64 w/Sideways	29.95
Word Writer 128 w/Speller	42.95
Word Writer 3 w/Speller	29.95
Partner 641	38.95

DIGITAL SOLUTIONS

Pocket Writer II	41.95
Super Pak 64	34.95
Super Pak 128	44.95

MICROPROSE

Conflict in Vietnam	24.95
Crusade in Europe	24.95
F-15 Strike Eagle	21.95
Gunship	21.95
Silent Service	21.95
Top Gunner	18.95

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130 screens of 3-D graphics, searching for clues and food and solving problems. And, of course, use throwing stars, swords, nunchkus, staffs, spears, Ninja magic, and your karate skills to overcome armed guards, wild animals, and deadly traps.

From Activision's Gamestar subsidiary, *Top Fuel Eliminator* ($29.95) simulates an entire season of drag racing. Players must fine tune their cars in the pit area, gun their engines properly to get off to a fast start, and shift gears in sync with their tachometers' RPMs to achieve maximum speed. Factors like engine failure, faulty traction, and improper shifting can affect the outcome of a race.

Four more additions to Activision's line of Solid Gold Software (that's Marketingese for "programs no longer moving at list price"): *Hacker, Ghostbusters, Little Computer People,* and *The Great American Cross-Country Road Race.* Each is $14.95 for the 64; Amiga versions of *Hacker* and *Little Computer People* are $24.95.

Finally, Activision will distribute a C-64 version of *Book One: Secret of the Inner Sanctum,* first in New World Computing's *Might and Magic* fantasy role playing series.

Activision, 415-960-0410 (see address list, page 12).

Firebird has adapted *Starglider* to Amiga format. The game requires you, as the driver of an airborne ground attack vehicle, to battle an almost invincible starship. Included are a flight training manual, full color poster, keyguide, and a 64-page novella. Price is $44.95.

Firebird (see address list, page 12).

From Electronic Arts:

Legacy of the Ancients ($29.95) transports C-64 fantasy adventure fans to the world of Tarmalon, where they attempt to retrieve a leather scroll with evil powers. The search winds through 12 towns, forests, castles, and dungeons filled with dangerous creatures.

EOS: Earth Orbit Stations ($34.95), a C-64 strategic simulation based on NASA's space development plans for the next 50 years, puts players in charge of building and managing space stations among the planets and moons of the solar system, ultimately leading to the search for alien life. Up to 39 different mudules such as shuttleports, space telescopes, and chemical labs can be used to construct an infinite variety of stations. There are seven different replayable game scenarios which can last from 2 to 40 hours.

The *Ferrari Formula One* driving simulation ($49.95) lets Amiga owners race a Ferrari F1/86 around 16 international race courses such as Monaco, Detroit, Monza, and Brands Hatch. The 16 tracks are authentic down to scenery and weather conditions, and the seven other racers are modeled after top contenders in the 1986 Formula One circuit.

The latest in EA's Amazing Software line for the 64: *Sanxion* (20 levels of 3-D landscapes and multiple waves of attackers), *Delta Patrol* (200 alien attack waves in over 50 environments), and on a single disk, *Dragon's Lair I* and *II.*

Amnesia, an interactive novel for the 64 by science fiction author Thomas Disch, puts the player in Manhattan without his memory but with a strange man who wants to kill him, a strange woman who wants to marry him, and a lot of other problems.

Age of Adventure ($14.95) consists of two C-64 games: *Return of Heracles* (perform Herc's 12 labors while rescuing Helen of Troy) and *Ali Baba and the Forty Thieves* (battle over 100 different creatures en route to rescuing a beautiful princess).

On EA's drawing board is a Commodore adaptation of *Chuck Yeager's Advanced Flight Simulator,* just released in IBM format.

Electronic Arts, 415-571-7171 (see address list, page 12).

Yak's Progress ($19.95) comprises eight C-64 games by British programmer Jeff Minter, including *Revenge of the Mutant Camels.* Most of the games revolve around the attempted domination of earth by the forces of Zzyax and Irata.

Eurosoft International, 203-838-9890 (see address list, page 12).

ShareData has released the first official versions of TV's three top game shows: *Family Feud, Wheel of Fortune,*

and *Jeopardy.* Each is for the C-64, and priced at $9.99.

ShareData, 602-961-7519 (see address list, page 12).

From Broderbund:

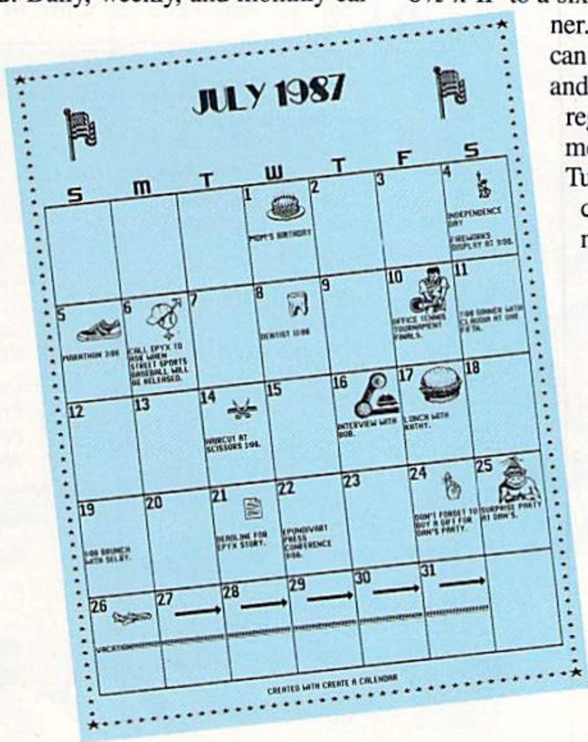
Previously a hit in the UK, *Cauldron* ($29.95) contains two complete quest games. In the first you take the part of a Witch Queen whose golden broom has been stolen by the Pumpking; in the second you're a loyal Pumpking warrior out to destroy the Witch Queen. The only way to win either contest is to collect ingredients to brew a magic spell in the cauldron.

Broderbund Software, 415-479-1700 (see address list, page 12).

GET ORGANIZED

Create a Calendar lets C-64 users make custom calendars with a variety of text, graphics, and borders. Graphics are included for birthdays, dental appointments, haircuts, and the like; graphics from Epyx's *Scrapbook Collection* and other *Print Shop*-compatible graphic disks can also be incorporated. Daily, weekly, and monthly calendars can be produced in sizes from 8½ x 11" to a six-page horizontal banner. Multiple lines of text can be placed on any day, and events that occur at regular intervals, like a meeting on the second Tuesday of every month, can be repeated automatically.

Epyx, Inc., 415-366-0606 (see address list, page 12).



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CRYSTALLUS

For the C-64

By Bob Blackmer

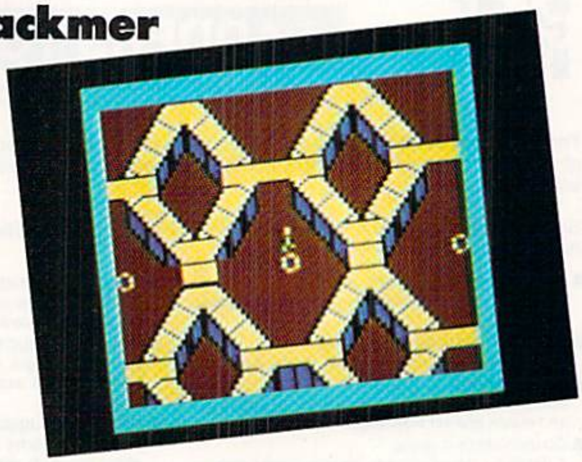


PHOTO: MICHAEL R. DAVILA

You are trapped in a huge complex maze made up of 36 interconnecting cubicles. Each cubicle in the maze contains shimmering crystals that emit audible tones when gathered. These tones are then absorbed into the walls of the structure. When all the tones have sounded, the structure will echo the melody of tones, causing a secret passage to open. The passage will be visible in an outer wall at the top or bottom of the maze. As you leave the maze, you will enter the courtyard which is surrounded by a brick wall. Somewhere in this wall will be an opening, your final hurdle to escape from *Crystallus.*

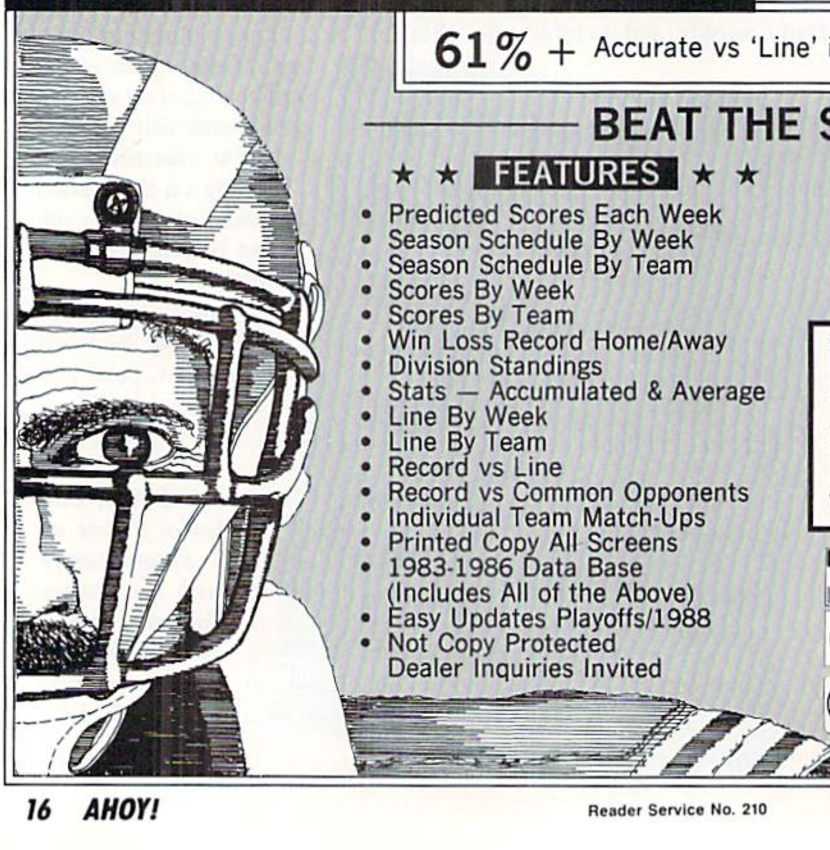
This game is different from most in that there is no scoring involved. You merely must finish your task to escape from the maze that bars your freedom.

This program is a good example of how to achieve a three dimensional look to a game. The custom character graphics create a maze that shows the walls and tops of walls in contrasting colors and drawn at the proper angles. The sprite priority register is set to display behind the screen data. This gives the effect of depth as the sprite moves through the cubicles in the maze.

You will need a joystick in Port 2 to play the game. The music used in this program may be familiar to some readers: it's taken from "Opus 6 No. 1" by Fernando Sor.

Crystallus is written in machine language and must be entered using *Flankspeed* (see page 79). After entering and saving *Crystallus*, reset the computer and LOAD "CRYSTALLUS",8,1. Then SYS 49152 to start. ☐

SEE PROGRAM LISTING ON PAGE 85



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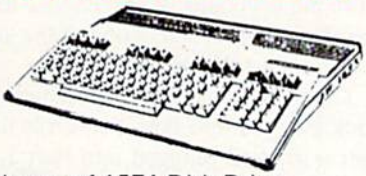
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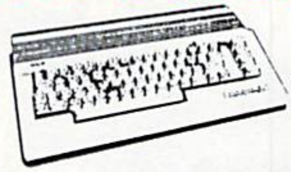
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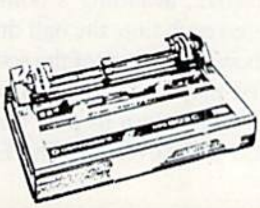
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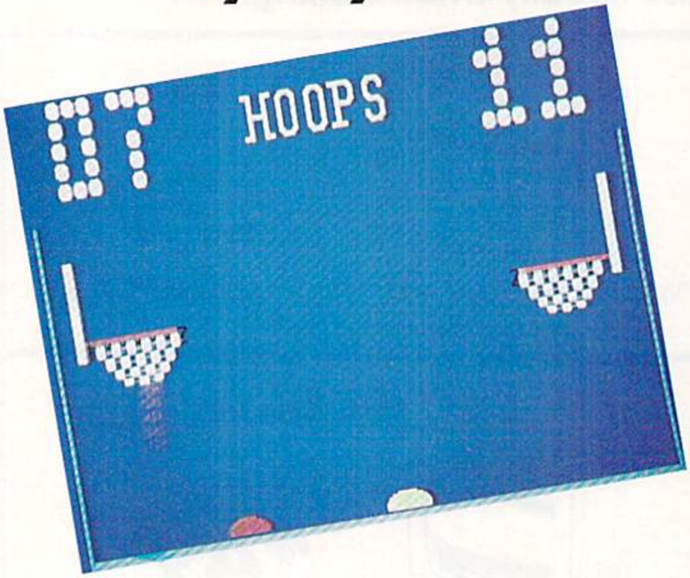
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HOOPS

For the C-64

By Tony Brantner



Hoops combines the games of basketball and computer pong into a fast action contest for one or two players.

Use *Flankspeed* (page 79) to type in and save a copy of *Hoops*. To run the program, type SYS 49152 and press RETURN to start.

When asked for the number of players, enter one or two from the keyboard. If you choose the one player game, you are also asked to select one of the six skill levels (warning: Level six is relentless!).

There are two paddles at the bottom of the screen. A joystick plugged into Port 2 controls the left paddle, while either a joystick plugged into Port 1, or the computer, controls the right paddle. Each paddle can be moved horizontally, but neither can cross the center of the screen.

The game begins with the ball being thrown into the air at center court. Use your paddle to hit the ball into the basket on your opponent's side. If you're not careful, you can knock the ball into your own basket, awarding a point to your opponent. One point is scored each time the ball drops through the basket. Scores are shown at the top of the screen on the giant scoreboard. The first player to reach 21 points wins. You can then press either fire button to play a new game. □ *SEE PROGRAM LISTING ON PAGE 82*

PHOTO: MICHAEL R. DAVILA

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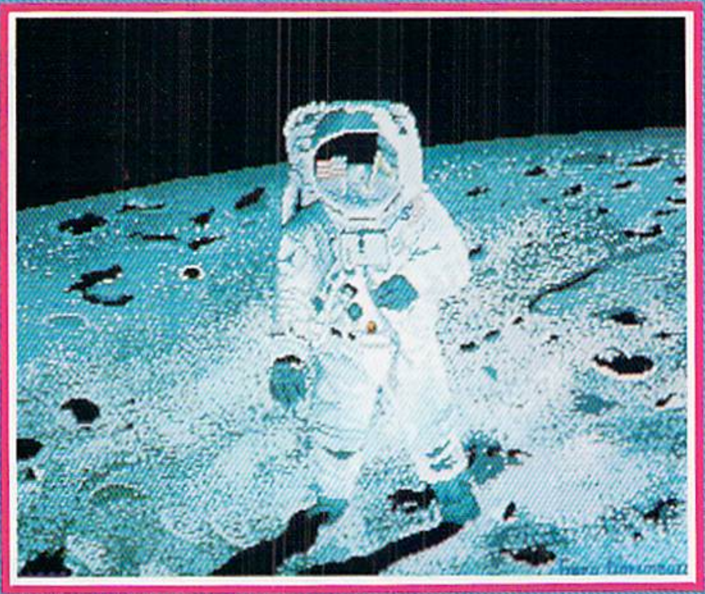
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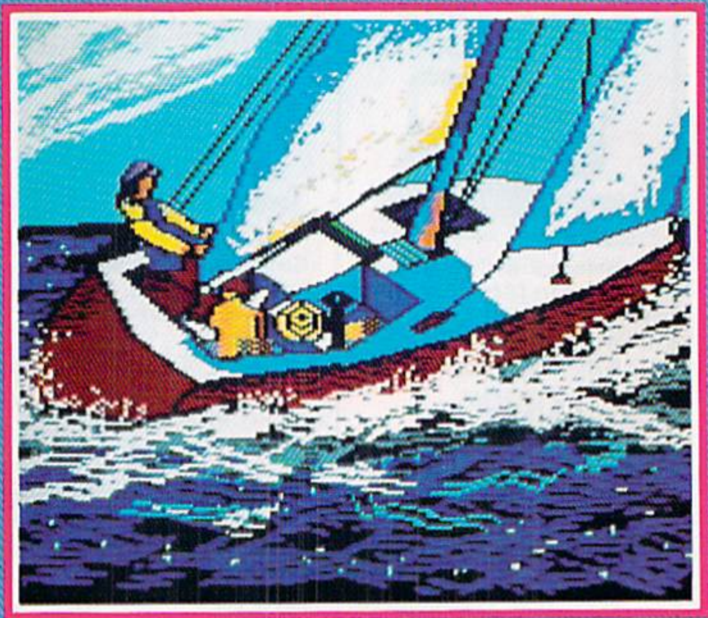
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The images on these pages are now available on a monthly disk. Multicolor images are supplied in *Koala* format, while high-resolution images are in *DOODLE!* format. Included are a slide show for easy viewing, along with a bit map dump for your 1525 printer or properly interfaced equivalent. A sample *Art Gallery* disk with slide show and printer dumps is $10; or send a stamped and self-addressed envelope (business size) for a listing of available *Art Gallery* collection disks. Prices shown are for US and Canada. All others add $3 per disk. New York State residents please add appropriate sales taxes. Disks may be ordered from Morton Kevelson, P.O. Box 260, Homecrest Station, Brooklyn, NY 11229.

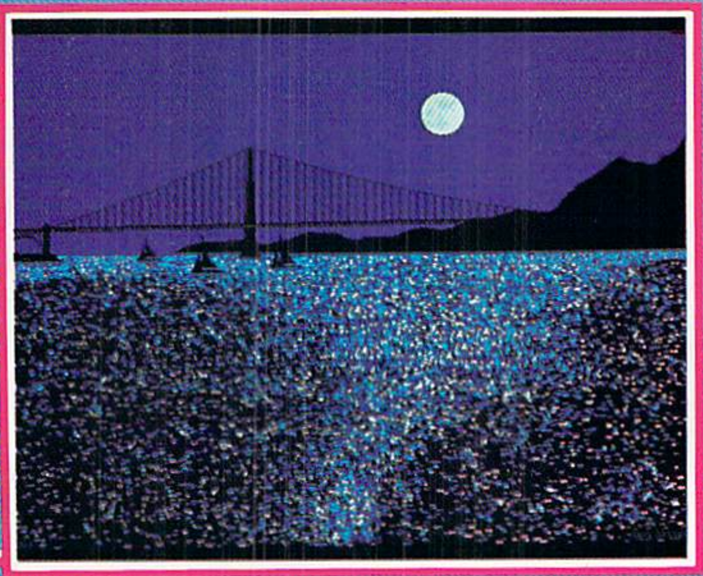
Contribute to Ahoy!'s Art Gallery

The *Ahoy! Art Gallery* offers the opportunity for fame and fortune to any and all aspiring Commodore artists. Simply send Morton (see address above) your work on disk indicating the drawing package or file format of the images. Inclusion of a self-addressed post card will guarantee an immediate response. All graphics produced on the C-64/ C-128, Plus/4, and Amiga computers are eligible. In exchange your work will receive the opportunity for display in these pages. All published works will receive royalties based on the monthly *Art Gallery* disk sales. Also, both published and unpublished images may be included on *Art Gallery* collection disks.

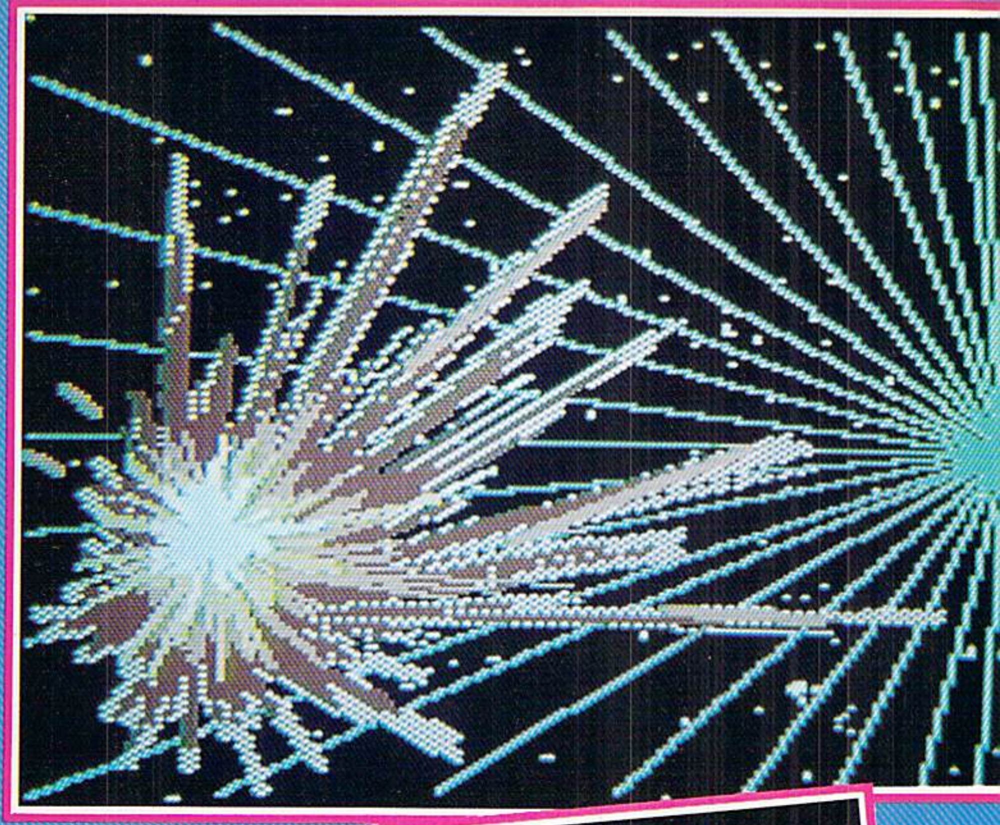
Note that the *Art Gallery* is not a contest. Published pictures are selected in an arbitrary and capricious fashion by the *Ahoy!* Art Director based solely on the artistic merit of the individual images.







If contributors to *Ahoy!'s Art Gallery* were polled on their favorite graphics format, *Koala* would win paws down! All of this month's masterpieces were generated on *Koala*, with the exception of two Amiga images—can you spot them? Answer appears below. At lower left, catch the wave with *Surf* by Heinz Diekert (Vernon, BC). The column of three to the left includes, top to bottom, *Moonwalker* by Gary Dominguez (Oklahoma City, OK); *Sail* by the ever-popular Alberto Valsecchi (Milano, Italy), and *San Francisco*, also a la Dominguez. To the right is the shooting star of our show, *Nova X* by Tom Kane (Buffalo, NY), and below it, *Cafe* by A. Black (Santa Rosa, CA). The Amiga images were the two by Gary Dominguez.





CENTERFOLD

For the C-64

By Buck Childress

Are your title screens leaving you a bit on the flat side? Or maybe you'd like to put a little more zip in your menus. Pretty colors and interesting graphics can help to pump them up, but sometimes even that's not quite enough. Without careful planning, title and help screens are about as exciting as a mud fence. However, there is an easy way to give a professional touch to your displays. If you've been looking for a way to add some pizzazz to the ol' mud fence, *Centerfold* is for you.

Centerfold gives the illusion of unfolding your screen from the inside out. Characters seem to spring forth from the center of the screen and race away from one another. It's as if the monitor's midsection were erupting with graphics, all charging toward the outer edges. Yet, when the unfold is complete, your original display is there intact, with each character retaining its own color. *Centerfold* works with all keyboard graphics, including custom characters. Here's how to use it.

After you save a copy of *Centerfold*, run it. The loader POKEs the machine language data into memory and checks for errors. Once the data is loaded, you're ready to go.

Centerfold can be operated automatically or manually. Automatic operation is handy when you're creating a screen display. Type SYS 49152 and press RETURN to activate it. Let's say you have a nifty little display on your monitor. All you have to do is take a "picture" of it. Just press the CONTROL and SHIFT keys at the same time. The screen border will flash when the picture has been taken. All the characters and their respective colors are now captured. Now press the CONTROL and COMMODORE keys together. You'll see your display unfold from the inside out. For a better illustration, clear the screen, then press the CONTROL and COMMODORE keys. Don't accidentally press the SHIFT key at this time or you'll capture a blank screen.

You can see a quick demonstration of *Centerfold* in action by listing it or whatever program is in memory. Now take a picture. Next clear the screen, then do an unfold.

While in the automatic mode, *Centerfold* waits until the cursor is between flashes before taking a picture or unfolding the screen. This avoids having an unwanted footprint left by the cursor. So if nothing happens the instant you press the keys, it will very shortly.

To deactivate the automatic feature, press the RUN STOP/RESTORE combination.

You can access the picture taking and unfolding routines by SYSing directly to them. Since a direct access will most likely be performed from within your programs, the cursor check and flash are bypassed. SYS 49394 takes the pictures and SYS 49246 folds the screen. For example, a line such as

```
100 SYS 49246
```

could unfold a title screen you had previously prepared. A line like

```
200 SYS 49394
```

would take a picture of the current screen display. Later your program could unfold it. You can create a lot of interesting visuals this way.

Whenever a picture is taken, the information is stored in memory from 49664 ($C200 hex) to 51712 ($CA00 hex). You can save different screens to disk or tape and recall them later for use in various situations and programs. *Data Express* (July '87 *Ahoy!*) will make the binary saves for you. Or you can use a machine language monitor. Use the above locations as the starting and ending addresses.

Experiment with *Centerfold*. It really is an exciting effect that will add a new dimension to your programs. With a little practice, you'll discover a whole new realm of possibilities with your screen displays. □

SEE PROGRAM LISTING ON PAGE 84

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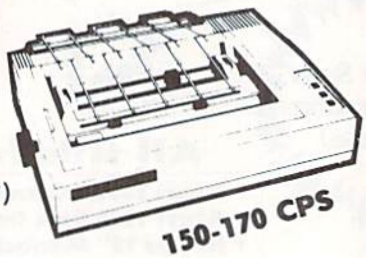
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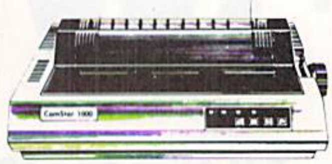
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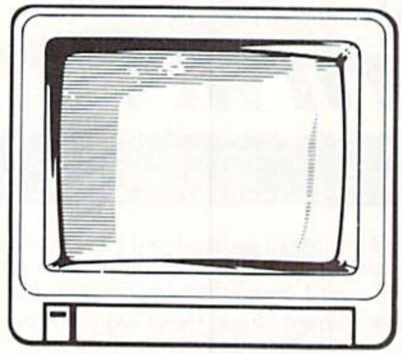
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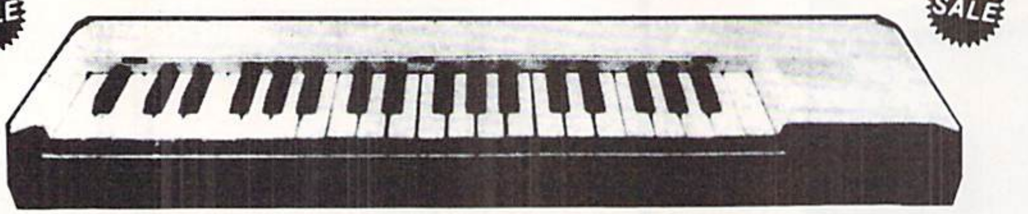
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NO NEWS

For the C-64 and C-128



By Buck Childress

All the king's horses and all the king's men can't put my program together again.

That little ditty kept echoing through my head as I lay in bed the other night. Earlier I had inadvertently dispatched a program to that Great Microchip in the Sky. It wasn't a large program, but it did have the answer to a problem that had been plaguing me for days. I wanted to compare my latest findings to the contents of another file I had saved previously. Without thinking, I loaded up the other file. By the time I realized what I'd done, it was too late. My program, along with its precious answer, had entered the Twilight Zone. For some strange reason I just kept hearing "All the king's horses and all the king's men...."

After losing the better part of a night's sleep, I decided it was about time to protect myself from me. Out of the bad news came *No News. No News* prevents programs from accidentally being transported to the Great Beyond. There are versions for both the C-64 and C-128.

After you've saved a copy of *No News*, run it. The loader POKEs the machine language data into memory and checks for errors. When the data is through loading, you can activate it. For the 128 type SYS 3072 and press RETURN. For the 64 type SYS 53000 and press RETURN. You deactivate it the same way.

There are a lot of ways to snuff out a program without switching off your computer or having it lock up. You can easily squash one with an errant load. If you're loading into an area of RAM that is currently in use, such as BASIC, the program being loaded will wipe out the one in memory. Kiss it goodbye. There's no way to get it back. If this happens, your only recourse may be two aspirins and bedrest. Of course you know about NEWing a program. If you don't panic, a rescue can sometimes be performed – if you know how. Running a program can be disastrous if it executes a NEW or LOAD command while in operation. And there's always the possibility of the computer locking up.

Naturally the best way to prevent these disasters is with safety saves. But, alas, you and I are only human. Sometimes our cranial microchips take a vacation and allow the Masters of Disaster to creep in. The only way to protect ourselves at such times is with a program that compensates for our temporary jellylike state.

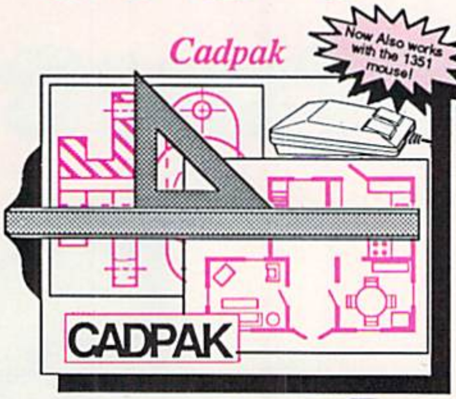
No News monitors your commands, even when your brain is sleeping. Whenever you enter an immediate mode command (no line number), *No News* checks to see if you've entered NEW, RUN, or LOAD. If you're using a 128 in 128 mode, it also checks for BLOAD, DLOAD, and BOOT. If any of these commands are encountered, *No News* gives you a chance to recant before the questionable deed is done.

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Don't suffer the bad news of a lost program. *No News* is good news! ☐*SEE PROGRAM LISTING ON PAGE 88*

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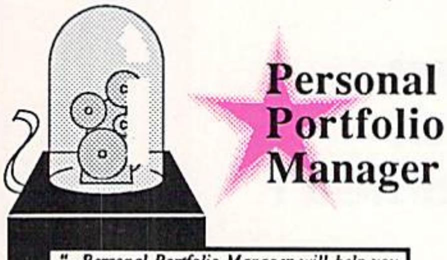


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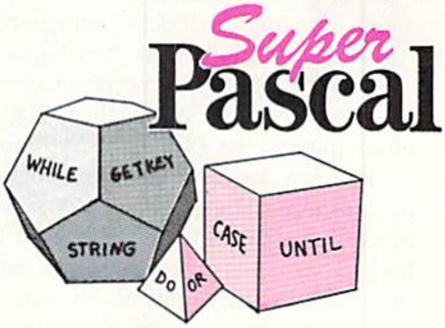
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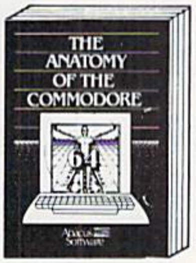
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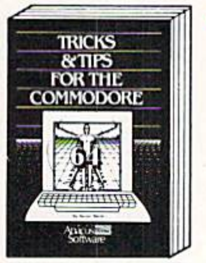
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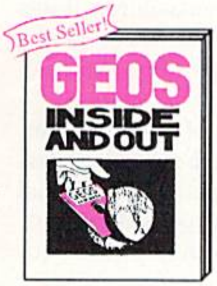
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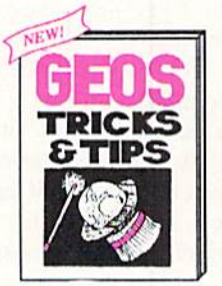
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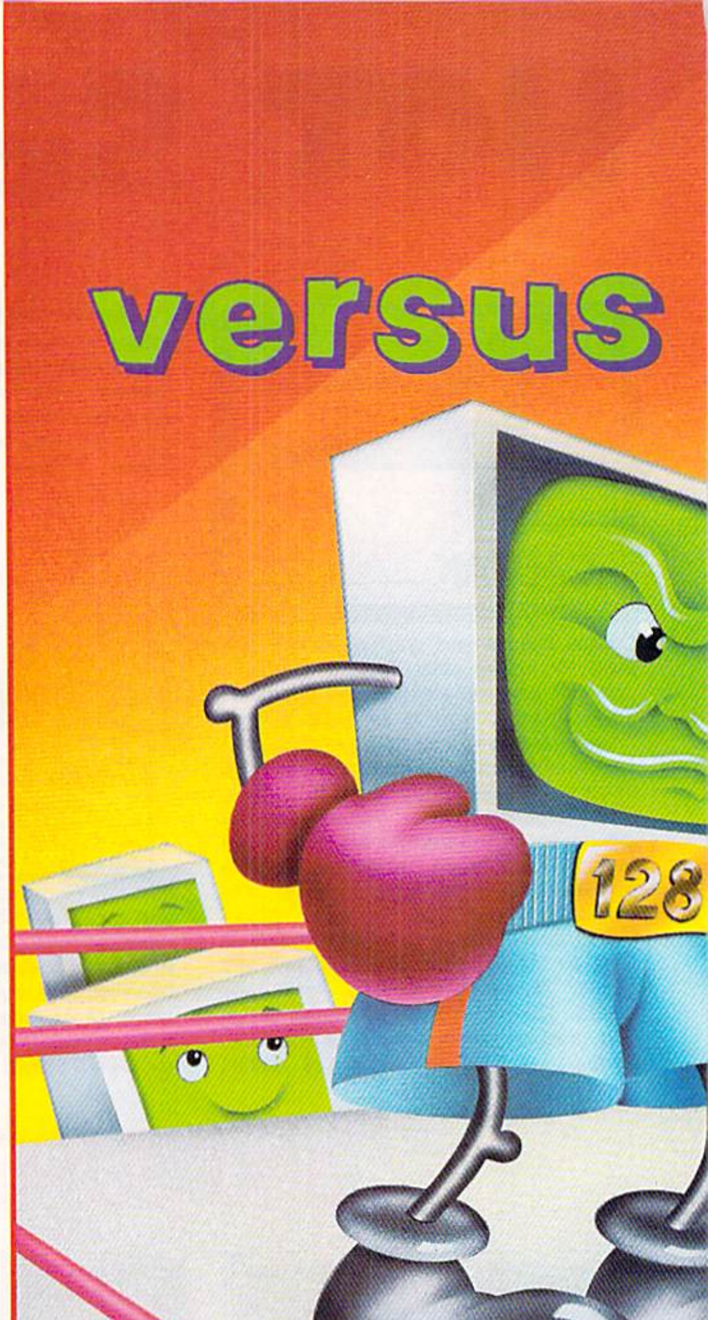
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The 128 versus



How Does the Commodore 128 Stand Up Against the PC Compatibles?

Commodore has recently introduced its own versions of IBM PC-compatible computers, which it is billing as "the Clone Killers." This is a good time to compare Commodore's more-familiar computers, the C-64 and the C-128, with this other breed of computers, the PCs and PC-compatibles.

There is a conglomeration of computers from numerous manufacturers whose main intent is to duplicate the functions of the IBM PC and to run all the software written for it. They sell at prices lower than the IBM version. These machines typically offer no innovations or enhancements over the original machine, and they are generally referred to as "clones."

Before the new line of IBM computers, the Personal System 2, was introduced in April, there were many rumors that IBM was out to "do in" the clone manufacturers. It was thought IBM would provide a computer with such sophisticated features and a low enough price that clone manufacturers could not compete.

It turned out that the bottom of the line of new IBM computers, the Model 30, is priced above the typical clones. It has some advanced features and it surpasses the original PC in many respects, but it is not the "below $1000, must-have computer" which some prognosticators foresaw (or hoped for).

Hence the Commodore PC10 is out to take on the task of "clone killer." With its $999 price tag and a nice combination of features, it may be competitive in the clone wars. Price is the main consideration among clone buyers, although reliability, product support, and brand name are also important to various degrees. How the PC10 will fare remains to be seen.

In the meantime, if you are wondering whether it is worthwhile to move onward from your C-64 or C-128, keep reading. We will compare functions, features, operating environment, and performance of the C-128 with the basic IBM Personal Computer, better known as the IBM PC. In the end, you may realize that your Commodore was, and still is, the best machine for your needs and budget. On the other hand, you may conclude that a PC-compatible clone is definitely your next machine.

PHYSICALLY SPEAKING

Physically the C-128 and the PC are quite different. (Discussions mentioning "PC" pertain to the IBM PC, the IBM XT, and PC-compatibles such as the Commodore PC10-1

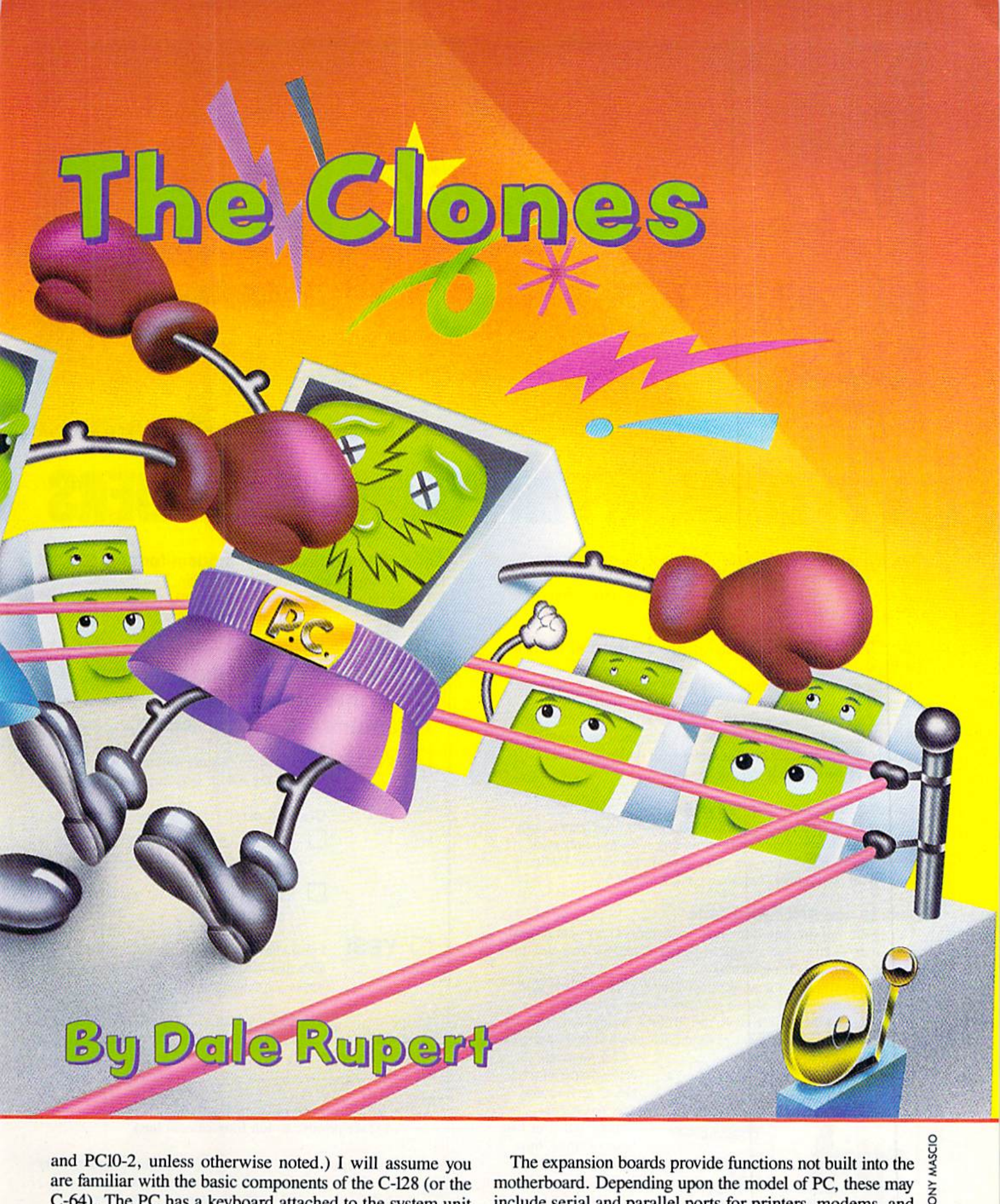


ILLUSTRATION: TONY MASCIO

and PC10-2, unless otherwise noted.) I will assume you are familiar with the basic components of the C-128 (or the C-64). The PC has a keyboard attached to the system unit by a coiled cord. The system unit is a box which contains the circuitry, the power supply, disk drives, and optional expansion boards. A video monitor and a printer complete the basic system.

The expansion boards provide functions not built into the motherboard. Depending upon the model of PC, these may include serial and parallel ports for printers, modems, and mice, as well as video display circuits, disk drive controllers, battery operated clock/calendars, and memory expansion. The add-on boards stand vertically within the system unit, mounted into connectors on the motherboard, with

other jacks and connectors coming out the back of the system unit. The system unit case must be opened for access to the motherboard and for changing the expansion boards.

COMPARING BRAINS

The PC uses a "16-bit" microprocessor, the 8088, running at 4.77 Megahertz (MHz). Let's compare the 8088 with the 8502 in the C-128. The 8502 (and its nearly identical twin 6510 in the C-64) are "8-bit" microprocessors running at 1 MHz. In C-128 FAST mode, the 8502 runs at 2 MHz.

The "8-bit" versus "16-bit" terminology can be clarified. This refers to the width (in binary bits) of the internal circuitry in each processor. Within 8-bit and 16-bit processors, data is transported among registers and processed within the "arithmetic logic unit" in 8 and 16 bit wide chunks, respectively.

The 8088 is an unusual 16-bit processor since it has an external data bus which is only 8 bits wide. This means that it usually fetches at least two 8-bit bytes from ROM for each instruction. A "true" 16-bit processor fetches 16 bits at a time on a 16 bit wide data bus. The external 8 bit data bus of the 8088 saves money and allows a more compact design at the expense of processing speed.

The 4.77 MHz and 2.0 MHz operational speeds also need explanation. Operations within a microprocessor are synchronized with an external system clock. The speed of operation depends not only on the clock speed but also on the number of clock cycles needed per instruction. In general, the PC is not 2.385 times as fast as the C-128, as the basic clock speeds might imply (4.77/2 = 2.385).

For example, the NOP (no operation) instruction on the PC requires 3 clock cycles, whereas the NOP on the C-128 takes only 2 clock cycles. One clock cycle on the PC is 1/ 4.77E6 seconds or 210 nanoseconds (ns). One clock cycle on the C-128 is 1/2.0E6 seconds or 500 ns. Therefore 3 cycles at 4.77 MHz is roughly 630 ns, and 2 cycles at 2.0 MHz is 1000 ns, so the PC is only about 1.6 times as fast at doing nothing as the C-128 is.

Consider one other assembly language instruction, "load accumulator from memory." On the PC this instruction takes a minimum of 10 clock cycles (2100 ns), whereas it takes as few as 2 clock cycles on the C-128 (1000 ns). Based on these numbers, the C-128 will be over twice as fast as the PC for some operations. We'll run some benchmarks later.

On the PC, the disk drives are accessed over a special parallel bus by means of a disk controller. As announced, the Commodore PC10-1 has one 5¼" floppy disk drive, and the PC10-2 has two. The controller circuitry is on the motherboard. The IBM PC requires a separate expansion board for the controller.

The standard floppy disk for the PC is double-sided, double-density, and it stores a nominal 360K bytes. The format of the PC disks is quite different from the C-128 disks. Double-sided diskettes on the 1571 store a nominal 339K bytes.

Actually the format of data on PC disks depends upon the version of the Disk Operating System (DOS, rhymes with "floss"). Unlike DOS in ROMs of the C-128's disk drives, DOS used on the PC is software based. The PC10 comes packaged with version 3.2 of MS-DOS. MS-DOS stands for Microsoft DOS. DOS sold by IBM is called PC-DOS, but it is essentially the same software. We will say more about the operating systems later.

The 8088 family in the PC includes a numeric co-processor called the 8087. This is an optional chip which provides significant speed improvement in mathematical processing for certain software. There is an empty socket on the PC motherboard for this chip. Numeric processing on the C-128 must be performed in software and is much slower.

Random Access Memory (RAM) on the C-128 is expandable up to 640K bytes, although only 64K is accessible at one time. This is because of the 8502's 16-bit address bus

Table 1
Benchmark Times (in seconds)

Test #	Description	PC	C-128 FAST	C-128 SLOW
1	FOR/NEXT	13.0	11.5	24.3
la	(optimized)	4.9	7.9	16.9
2	Math Op's.	7.8	10.9	23.1
3	String Op's.	7.2	8.3	17.5
4	Disk Write	16.9	31.1*	42.6*
5	Disk Read	10.1	16.9*	23.1*
6	Vert. Print	49.7	50.7	86.4
7	Horiz. Print	18.7	9.6	19.0
8	Random Numbers	6.6	9.0	18.9
9	Random Points	7.7	8.9	18.7
10	Random Lines	3.7	4.2	8.6
11	Random Circles	4.3	26.5	56.2

*used manual stopwatch for these times

(2 ↑ 16 = 64K). The Memory Management Unit in the C-128 can shuffle 64K chunks of memory so that some software can use the full complement of memory.

The 8088 processor on the PC has a 20-bit address bus. This provides an address space of 1 Megabyte, of which a maximum of 640K bytes in standard configurations is RAM. There are various software controlled bank-switching techniques to allow more than 640K of RAM. Some expansion boards allow 2 Megabytes or more of RAM to be used on a PC.

The significantly larger address space as well as the 16-bit data bus give the PC the power to handle much larger and more complicated software than the C-128 can.

Another important distinction between the two classes of computers is that the PC uses RAM with parity checking. Each byte of RAM on the PC requires nine bits, eight data bits and one parity bit. The parity bit is an error checking mechanism. It is set to zero or one so that the sum of all nine bits in the byte is odd (for odd parity).

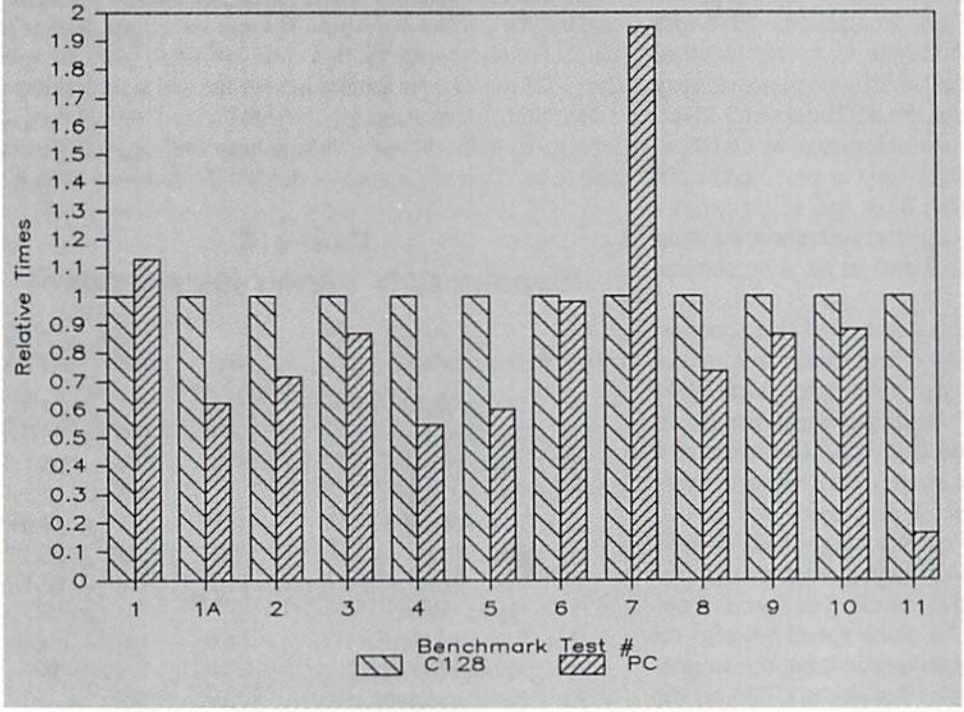
Circuitry checks the parity of each data byte read. If the sum of the nine bits is even, hardware flags the error and software identifies the problem. This guarantees that bits of data cannot be changed by gamma rays or faulty circuitry, for example, and go undetected.

In a game of *Asteroids*, an improperly written or read data byte is usually inconsequential. On the other hand, when the computer is calculating your company's payroll,

it is probably not worth the gamble that there are no gamma rays heading your direction. Parity checking is reason enough to use a PC in business environments.

"320 by 200 with 16 colors" on the C-128 is misleading since there are not 16 independent colors for any two adjacent pixels. There are no such restrictions on the PC.

FIGURE 1 — BENCHMARK TESTS



OPERATING ENVIRONMENTS

The operating environment of the PC is quite different from that of the C-128. When you boot up the C-128, you are usually in BASIC. Disk and file commands are all given from BASIC. But a normal bootup on the PC puts you into the Disk Operating System (DOS) environment.

From DOS on the PC, you may format disks, copy files and disks, display directories, and perform other disk-related activities. You may also execute machine language programs such as spreadsheets, word processors, games, utilities, or programming languages by entering the name of the program. You do not do any normal programming in DOS. You generally go from DOS into an editor or into a programming language to write programs. MS-DOS on the PC is very similar to the CP/M environment on the Commodore 128.

To program in BASIC, you execute the command BASICA (or GWBASIC) from DOS. This command loads and runs a machine language program named BASICA.COM (or GWBASIC.COM). Now you are in a BASIC environment comparable to BASIC 7.0 on the C-128.

On the C-128, BASIC is entirely in ROM. You don't load it from a disk. (Other languages such as COMAL and Pascal need to be read from a disk or a ROM cartridge.) On the IBM PC, the core of BASIC (called Cassette BASIC) is in ROM, and only the advanced features of disk BASIC (called BASICA) are loaded from disk.

The PC clones generally do not contain any BASIC in ROM. Therefore the entire BASIC language must be loaded into RAM from disk. GWBASIC is a full-featured BASIC compatible with IBM BASICA which is included with the PC10. GWBASIC is sometimes called "Gee Whiz BASIC" because it provides more "bells and whistles" than older versions of BASIC did. GWBASIC is a version of Microsoft BASIC just as BASICA, BASIC 2.0, and BASIC 7.0 are.

GRAPHICS GALORE

Among the most confusing aspects of the PCs is their wealth of video standards. The video driver circuitry is provided on an add-on board for the IBM PC and for the PC10. The video adapter board in the PC10 is very versatile, enabling that machine to run essentially any software on any video monitor.

The video adapter in the PC10 duplicates the functions and modes of the IBM Monochrome Display Adapter, the IBM Color/Graphics Adapter (CGA), the Hercules Graphics Adapter, and the Plantronics Color Board. CGA is the most common color/graphics standard, providing 320 by 200 resolution with four colors or 640 by 200 resolution in monochrome. The Hercules and Plantronics standards are supported by some software packages. The Hercules standard provides higher resolution graphics on the IBM Monochrome Display, and the Plantronics standard gives higher resolution and more colors on a color display.

Two newer graphics modes using the Enhanced Graphics Adapter (EGA) and Video Graphics Array (VGA) could be added to the PC10 by replacing its video board with either an EGA or VGA board. These two modes provide even higher resolution and many more colors, but they each require different video monitors as well. As an example, EGA provides up to 640 by 350 pixels with 16 out of 64 colors. VGA goes on up to 640 by 480 pixels with 16 colors or 320 by 200 with 256 colors out of a total of 262,144 colors.

Unlike the C-128 where all pixels within an 8 by 8 block must be one of two colors (foreground or background), the color of each pixel on the PC is individually definable. The

BASIC COMPETITION

As C-128 owners know, BASIC 7.0 is a very powerful programming language. It provides functions specifically for the C-128 such as sprite graphics and SID sound generation which are not available with PC BASIC. The PC has very elementary sound capabilities, and it does not pro-

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vide hardware supported graphics objects such as sprites.

PC BASIC does include two fairly sophisticated "sub-languages," one for sound and another for graphics. The PLAY command is similar to PLAY in BASIC 7.0. Strings of characters may be combined to produce musical output. The DRAW command in PC BASIC is more powerful than DRAW in BASIC 7.0, which is primarily a line drawing command.

DRAW in PC BASIC uses strings to define sequences of cursor movements and graphics commands. This gives capabilities comparable to "turtle graphics" in LOGO and other languages.

It is interesting that some commands with identical names behave identically in the two breeds of BASIC while others are quite different. Be careful if you are translating between PC BASIC and C-128 BASIC. For example, LOCATE, GET, PUT, SWAP, WIDTH, and WINDOW are used in both languages but for very different purposes. Other similarly named commands may be subtly different. And sometimes, completely different names, such as CLS and SCNCLR or VARPTR and POINTER, are used for identical purposes. Let's hear it for standardization!

PC BASIC requires that spaces or separators be used between keywords and variables. An advantage of this is that variable names may contain keywords. In PC BASIC for example, GOAL, FONT, and VALUE are valid variable names. Use those in your C-128 programs and you will end up with syntax errors. Another advantage of spaces is that programs written for the PC are inherently more readable. On the C-128,

```
FORN=QTOM:J=TAN(N):PRINTJ:NEXTN
```

is confusing but allowed. It must be written with at least this many spaces on the PC:

```
FOR N=Q TO M:J=TAN(N):PRINT J:NEXT N
```

PC BASIC allows variable names of any length. Also, PC BASIC allows groups of variable names to be of a specific type, such as integer, single precision, string, or double precision. DEFINT A-J defines all variables beginning with letters from A through J to be integers.

PC BASIC allows programs to be merged or chained at run time, and it allows variables to be passed between programs. This is not explicitly supported in BASIC 7.0, but it can be done to a limited extent. PC BASIC also allows programs to be saved in tokenized form or in ASCII (text) form. Either form of the program can be loaded and executed. This process is more cumbersome on the C-128.

The file handling and communications commands are much more complete in PC BASIC than in BASIC 7.0. Also, PC BASIC provides numerous "interrupt-driven" commands for event trapping. In BASIC 7.0, the TRAP command provides run-time error-detection capabilities. Normal operation of the program can be interrupted and rerouted when an error occurs.

PC BASIC allows event trapping for errors as well as for keystroke, joystick and light pen, serial communications, and timer inputs which may be asynchronous to the normal program flow. A program need not continuously read the keyboard to know when a certain key is pressed, for example. The specified keystroke will make the program stop what it's doing and branch to the interrupt routine.

All in all, PC BASIC (BASICA and GWBASIC) is quite similar to C-128 BASIC (BASIC 7.0). They both allow the programmer to take full advantage of the respective computers without requiring the endless PEEKs, POKEs, and contortions of the less powerful versions of BASIC.

HEAD TO HEAD

How do the C-128 and the PC compare when running identical BASIC programs? That is the idea of benchmark testing. Benchmarks are programs which test various aspects of performance. The choice of definitive benchmark programs can be quite complicated. We don't need much sophistication to get a "ballpark" estimate of relative performance. *Benchmarks Galore* (see page 81) shows the tests run on the C-128.

For a start, Benchmark #1 is this simple FOR-NEXT loop:

```
100 FOR N=1 TO 10000 : NEXT N
```

On the C-128, we use these lines to measure the time in seconds:

```
20 T0 = TI
50 PRINT (TI-T0)/60
```

For the PC, the equivalent timing is performed by these lines:

```
20 T0=TIMER
50 PRINT TIMER-T0
```

There are two versions of Benchmark #1. The first is listed above. The second is optimized as much as possible for each machine. For the C-128, all spaces were removed from line 100 and the NEXT N statement was changed to NEXT. Only the spaces on either side of the colon can be removed for the PC. More significantly, N was specified to be an integer instead of a single precision variable. Line 100 for the PC becomes

```
100 FOR N%=1 TO 10000:NEXT
```

where the percent sign indicates an integer variable, just as it does on the C-128. The C-128 does not allow integers as FOR/NEXT loop variables.

From the time results in Table 1 (page 35), the C-128 in FAST mode is about 10 percent faster than the PC for the unoptimized program, but it is much slower than the PC in the optimized versions.

Figure 1 (page 36) displays the data for the PC and the C-128 in FAST mode from Table 1. The data from the table is first divided by each 128 time, so the 128 values are all normalized to one. A PC value greater than one means the PC is slower than the 128. PC values less than one correspond to tests in which the PC is faster than the 128.

Benchmark #2 performs a mix of single precision (floating point) math operations. The main program line for the two computers is the following:

```
220 K=K+(K-.6)*K/(K+.03)
```



Why dinosaurs never had computers.

Table 1 shows that the PC outperforms the C-128 on this somewhat limited test.

Benchmark #3 combines various string operations. The main statement is in line 320:

```
320 N$=MID$(LEFT$(N$+"AHOY",3),2,1)
```

The results in Table 1 show that the PC has a slight edge with these string manipulations.

The disk access tests used the 1571 drive on the C-128. Benchmark #4 writes 1000 numbers to the sequential file "Test," and benchmark #5 reads those 1000 numbers. The key statements in each test are lines 430 and 530:

```
430 PRINT#1,N
530 INPUT#1,K
```

The PC is nearly twice as fast as the C-128/1571 combination in both of these tests. I used a stopwatch for these tests since disk operations on the C-128 disable the jiffy clock interrupt. The times given by the program are much less than the actual times listed in Table 1.

The IBM PC is notoriously slow in certain types of screen updates. Tests #6 and #7 print 1000 numbers vertically and horizontally on the screen. The C-128 and the PC were both in 80-column mode for these tests. Test #6 is a measure of screen scrolling speed. It simply prints numbers 1 through 1000 vertically with this statement:

```
620 PRINT N
```

Test #7 measures screen writing and scrolling speed. It should be noted that the C-128 and the PC treat this statement in line 720 differently:

```
720 PRINT N;
```

The PC does not print a number at the end of a line if there is not room for the entire number. The C-128, on the other hand, fills all lines completely, breaking a number into two lines if it doesn't fit. The PC gives a better display at the expense of speed. Table 1 shows that the PC is comparable to the C-128 in scrolling speed, but the C-128 is nearly twice as fast at writing horizontally to the screen.

Benchmark #8 compares the speeds with which the two machines calculate random numbers from 0 to 320 and from 0 to 200 with this line:

```
820 R=RND(0)*320 : R=RND(0)*200
```

The PC version omits the "(0)" in both places. This could account for some of the PC's speed advantage over the C-128 in this test.

The last three benchmarks compare graphics display speed. Both computers draw in one color on a 320 by 200 resolution screen in these tests. Benchmark #9 puts points randomly on the screen. (By the way, it also shows how non-random these points really are.) The versions for the C-128 and the PC are as follows:

Continued on page 62

Featured This Month:

SUPERSTAR ICE HOCKEY
Mindscape
Commodore 64/128
Disk; $34.95

The weather outside is still delightfully warm, but here's one game which makes contemplating the oncoming winter a little less painful.

Superstar Ice Hockey is the best action-strategy sports simulation ever published. Period. It provides superb graphics and realistic play, and the opportunity to experience this blindingly fast sport as a general manager, coach, and skater.

Prior to the start of actual play, the computer must make several decisions. The user can select teams with either four or the regulation six players per side and decide whether to direct the squad from the sidelines or personally lace on the skates.

As the coach, the user can juggle lines and select offensive and defensive strategies. The team with the puck can stick to a balanced strategy, set up the center for a shot, or choose an all-out attack. The defender can forecheck, protect the goal, or use a balance attack similar to the offense option.

Every participant must shoulder the responsibilities of the general manager between games. In this role, the user can make trades, recruit (create) players, and send the team to Training Camp during the off-season to sharpen skills. At the end of each four-game season, the program assigns "trading points" to each team based on its performance. The worst team gets 1000, while the Cup winner receives a mere 50. A team expends points when trading, training, and in recruitment.

Thus franchises at the bottom of the league possess the most resources with which to improve for the following season. This diverges from the real-world situation, in which the rich frequently get richer, but it ought to keep one team from dominating play for very long.

Superstar Ice Hockey uses the standard three-quarters perspective, but keeps the boards low so they don't obscure the puck. Players skate, check, stick handle, and shoot with breathtaking realism in response to joystick movements. Goalies drop to their knees, make stick and glove saves, and clear the puck away from the goal crease just like they do in the National Hockey League. The animation incorporates many subtle nuances, such as the way the goalie lifts his shoulder to block shots.



Superstar Ice Hockey *uses the standard ¾ perspective, keeping the boards low so they don't obscure the puck. The animation incorporates many subtle nuances.*
READER SERVICE NUMBER 173

While playing the game as the goaltender offers an interesting change of pace, most users will prefer to skate as the center. The extensive, but straightforward, joystick control system allows the skater to shoot low on the ice, take slapshots, flip wrist shots, pass, check, and even execute fakes.

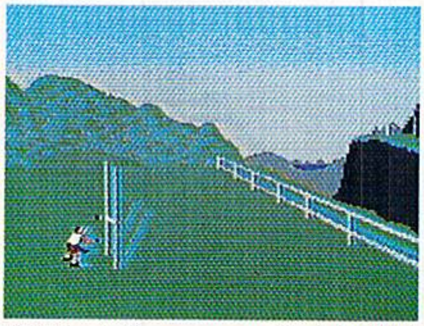
The simulation of skating is flawless. Players skate in circles to build momentum, but they lose speed due to fatigue as the game progresses.

The game includes offsides calls (the linesmen show no mercy) and penalties. As is all too common in the actual NHL, the refs are completely arbitrary and frequently one-sided. If they whistle a player off the ice once, the odds increase that they will catch him again later for some future infractions. Meanwhile, another skater may gleefully chop and slash without drawing a referee's eye.

The early work of chief engineer Ed Ringler should be well known from his stint with Gamestar. *Superstar Ice Hockey* demonstrates his continued development as a creator of superb action-sports simulations.

If this program has a drawback, it's that it may be too detailed. It is so realistic that it may intimidate those users not conversant with the workings of professional ice hockey. True puck partisans, however, will want to canonize Ringler. Bravo!

Mindscape, Inc., 3444 Dundee Rd., Northbrook, IL 60062 (phone: 312-480-7667). *—Bill Kunkel*



Highland Games: *on a Scotch disk?*
READER SERVICE NO. 174

HIGHLAND GAMES
Artworx
Commodore 64/128
Disk; $14.95

The success of *Summer Games* (Epyx) and its sequels *(Summer Games II, Winter Games,* and *World Games)* made sports anthology disks a popular category of computer entertainment. This collection of tartan track and field contests by Supernova is squarely in the tradition of Eypx's series.

Unfortunately, *Highland Games* has little originality in content and some definite flaws in the area of implementation. Set in the Scotch Highlands, this program simulates six events which range from the obligatory Long Jump,

Discus, and Hammer Throw to more exotic contests like the Weight Toss, Caber Toss, and Tug of War.

The Hammer Throw is the anthology's most successful game. Its clever play-mechanic conjures up a genuine feeling of weight and movement. The Long Jump and Discus offer nothing that hasn't been seen many times in similar software packages.

You'd think Caber Toss simulations would be few and far between. Surprisingly, this is the second in recent memory. *World Games* also included an electronic version of that competition. Neither one is likely to start a run on Cabers.

The one in *Highland Games* is a total washout. It combines an uninspiring visual with an awkward joystick-activated control scheme.

In the Weight Toss, a kilted clansman swings a weighted chain back and forth between his legs three times and then throws the thing over a horizontal bar. In a sense, it's like the high jump or pole vault in some other sports anthologies. The computerist must set the height of the bar and work up to the day's peak toss little by little. This event, too, is sabotaged by its graphics. Clunky linework added to awkward animation provide unintentional humor on those through-the-legs warm-up swings.

The graphics in *Highland Games* fall short of player expectations for such programs. The onscreen athletes are tiny, as though the user were watching the event from a nearby hilltop. This gives the Hammer Throw a nice, open-air feel. In other events, however, the miniscule animations make it difficult for the user to relate to the action occurring onscreen.

The sound track is composed primarily of bagpipe riffs. The well-executed musical phrases introduce the program and play between events.

Putting the Scotsmen through their paces boils down to a lot of joystick jiggling. Other games have employed a similar command control system, and it always guarantees a sore hand by the end of a play-session.

The Tug of War is the most unique event on *Highland Games,* but the lack of a solitaire option cuts into its appeal. Each participant controls the "anchor" of a four-man team and keeps him in synch with his mates as they struggle to drag the opposition across the midway mark. Nothing too complex about this contest, but it offers some fast head-to-head gaming fun.

Highland Games is part of the Artworx line of budget-priced software, so it may be unfair to expect it to equal the quality of programs which cost four times as much. On the other hand, a dull game is no bargain. *Highland Games* has at least a spark of interest for computerists who haven't gotten their fill of track and field simulations.

Artworx, 1844 Penfield Rd., Penfield, NY 14526 (phone: 716-385-6120). *—Bill Kunkel*

PRESIDENT ELECT: 1988 EDITION
Strategic Simulations
Commodore 64/128
Disk; $24.95

The quadrennial campaign for the Presidency is the biggest high-stakes game in the United States. The winner assumes the most powerful position in the world's mightiest democratic republic, and the loser becomes tour guide on the oblivion express.

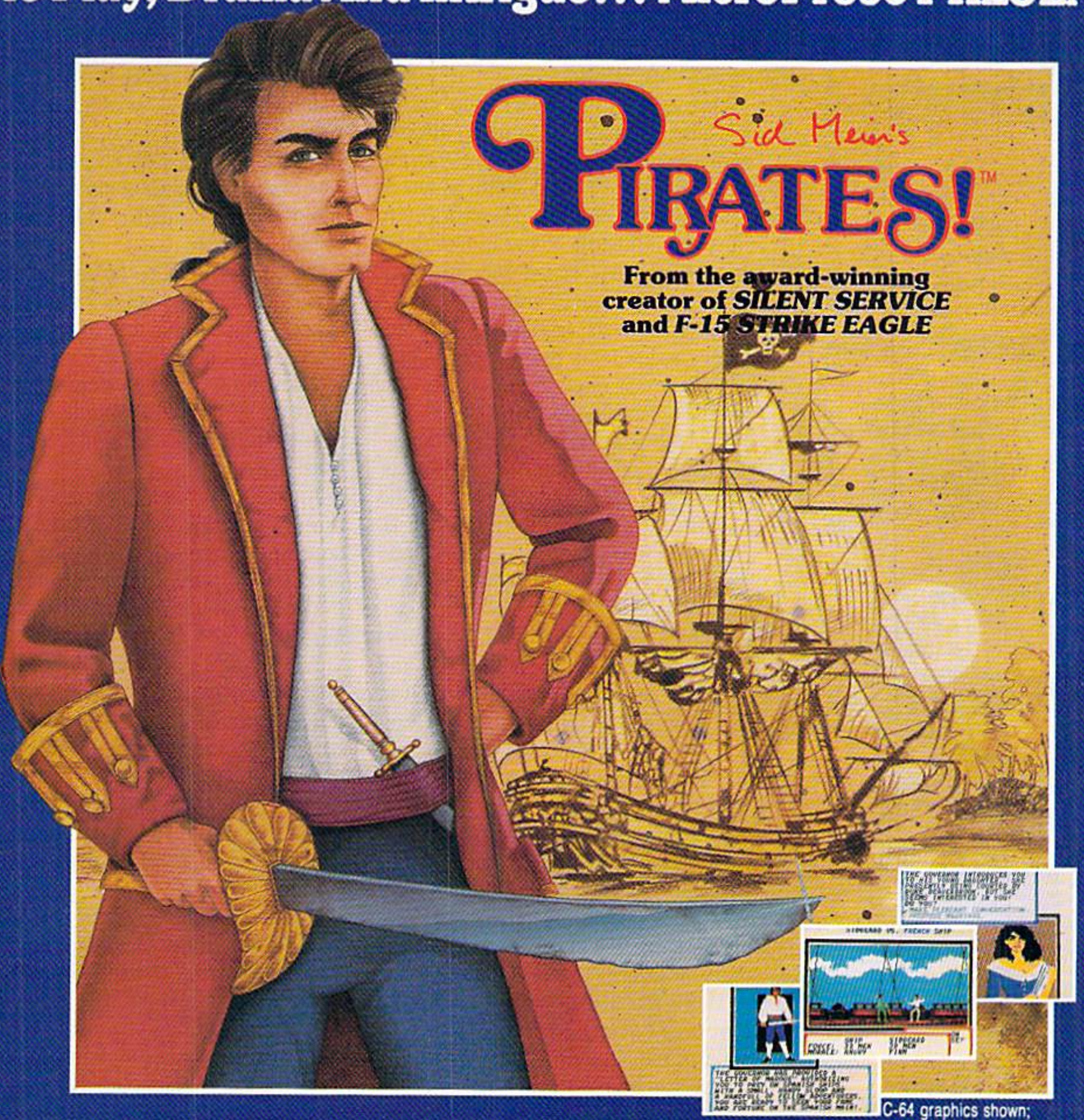
Strategic Simulations introduced the original *President Elect* before the 1984 election in which incumbent Ronald Reagan recorded a smashing victory over his rival, Democrat Walter Mondale. Many thought that the simulation of the race for the White House was more exciting than the actual election.

Four years is a long time in the computer software field, and the intervening years have not been totally kind to Nelson G. Hernandez, Sr.'s design. The drab sound and graphics, in particular, are substantially below today's sophisticated audiovisuals in quality.



An electoral map of the US shows which President Elect *hopefuls own which states, and which states are on the borderline. Factors like fatigue and overexposure can diminish a candidate's appeal. For a more complete list, see a certain Senator from Colorado.* READER SERVICE NO. 176

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C-64 graphics shown; Actual screens may vary.

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Reader Service No. 189

Ken Coates' Commodore 64/128 version of *President Elect: 1988 Edition* won't bowl over anyone with sensational programming innovations, but it overcomes its humdrum presentation with a detailed and flexible simulation of big-time politics.

One to three players can run for the Presidency under the same conditions which candidates faced in any of the elections from 1960 to 1988. Students of history and political prognosticators can even adjust the economic and political factors associated with any campaign to create an unlimited number of exciting "what if?" scenarios. The computer can guide up to three candidates if there aren't enough human participants to fill out the ballot.

Crystal-clear prompts lead computerists through the smooth routine of play as *President Elect* chronicles the race from Labor Day to Election Eve. The candidates must use the nine weekly turns to pile up enough support to carry the Electoral College.

Political action points are the "currency" candidates "spend" during the election. During the tussle for the top spot, candidates expend their PAP on overhead, advertising, campaign stops, and foreign travel.

Since every campaign has continuing expenses, overhead starts at a hefty 500 PAPs for a major party candidate and rises by 100 PAP per week. Weaker organizations cost a little less to maintain, and the overhead for third party nominees varies.

There are three types of campaign advertising. Each has a different purpose. A national effort sways the most voters per PAP, but this broad brush effort is not focused enough to influence particular states. Regional campaigning can inspire a meaningful voting shift, but only in one section of the country. The best way to push a large state with a close race into your column is with state-level ads, but it can be expensive.

Electronic and print advertising bring the candidates to millions of voters, but personal appearances still have the power to affect the outcome. The program assesses costs based on the number of regions and states entered and the number of individual stops.

Fatigue may hamper a candidate who undertakes a particularly strenuous whistlestop tour. Also, the law of diminishing returns quickly curbs the effectiveness of personal appearance if a politician schedules too many for the same week. A nice touch is that the effect of personal appearances is cumulative over the course of the race, so that the candidate who ventures among the voters to "press the flesh" on a regular basis gradually develops an advantage over one who lets his or her media image substitute for old-fashioned stump speaking.

Each party decides on foreign travel during the first week of the campaign. All candidates must decide where and when they will take a trip and how long they will stay. A visit to a foreign nation is a gamble that can help or hurt, depending on what happens abroad.

Any time all candidates agree on the format, a debate is held. These direct confrontations, which the program handles abstractly, can conceivably turn the course of a race and allow a dark horse nominee to come from behind.

An electoral map of the United States is the main visual. Each week, it shows the current status of every state. Color coding shows computerists at a glance which states are firmly in one candidate's camp, and which are too close to call. On election night, the map reports the state-by-state vote as it is tabulated.

It's a funny-looking map, though it gets the job done. One which depicts the United States as much less tall and skinny would be a good enhancement for the 1992 edition of *President Elect.*

The documentation is exemplary. The printed booklet carefully explains the overall concept and every major specific rule, and a section in the back contains helpful information about every election since 1980. Ondisk tutorials and demos buttress the printed documentation by providing specific examples of actual play.

The form could have used a little more polishing, but the content of *President Elect* preserves its status as a classic electronic strategy contest. *President Elect* is both absorbing entertainment and highly illuminating about our country's political system.

Strategic Simulations, 1046 Rengstorff Ave., Mountain View, CA 94043 (phone: 415-964-1353). *—Arnie Katz*

TIPS AHOY!

Compiled by Michael R. Davila

Contributors to *Tips Ahoy!* will be handsomely compensated immediately upon acceptance. Send your best programming or hardware hints to *Tips Ahoy!*, c/o Ion International Inc., 45 West 34th Street–Suite 500, New York, NY 10001. Include a stamped and self-addressed envelope if you want your submission returned.

SCREEN STUFF

Printing a message onscreen is easy enough, but doing it in an out of the ordinary manner can be one of the most time-consuming tasks in programming. Here is a ready-to-use subroutine that you can put in your programs either unchanged or improved to suit you. The sprinkling of REMs stating the purpose of variables should be helpful in making modifications. The REMs can of course be omitted when typing the subroutine into your own programs.

In the listing, lines numbered below 500 are simply preparatory. The working subroutine begins at Line 500, and expects to find the message text either in string ME$, or in consecutive elements of string array ME$ beginning with element number one. Element number zero should not be used.

In *Drop In* each character runs across the screen and drops into its proper place to form the message that is contained in string ME$.

Try this, or a modification of it, to add a bit of variety to the onscreen messages or menus in your own programs.

—C.C. Stadler
Waynesville, NC

```
100 INPUT"ENTER MESSAGE (40 CHAR. MAX.)";ME$
110 GOSUB 500
120 STOP
130 :
500 ::REM "DROP IN" DISPLAYS STRING ME$, FORTY CHARACTERS MAXIMUM
510 W1=1:REM CHAR. POS. IN TEXT STRING
520 PRINT"[DOWN][DOWN]"
530 FOR N=1 TO W1:CH$=MID$(ME$,W1,1):PRINT"[LEFT] "CH$;:GOSUB570:NEXT
540 GOSUB570:PRINT "[LEFT] [DOWN][LEFT]";:GOSUB570:PRINT CH$;
550 IF W1<LEN(ME$)THEN W1=W1+1:PRINT:PRINT"[UP][UP]";:GOTO530
560 PRINT"[3"[DOWN]"]":RETURN
570 FOR M=1 TO 5:NEXT:RETURN
```

DISK CHECK

If you have ever run into complications due to a disk error, you'll see the value of this program. I was going to make it read the entire disk, but not that many people want to read an entire disk for errors. So instead I gave you a choice of ways to read errors on a disk. In fact, I crushed the program into only 15 lines to make it easy to type in and useful for everybody. You can elect to:

1. Check Whole Disk (examine the entire disk for errors).
2. Quick Check (check only the first sector of each track).
3. Check 1 Track (examine only the track you specify).
4. Exit/End (quit program and enter regular mode).

If your program is free from errors, you will not see any error messages on the screen. If you're not very sure if the program works or not, simply try it out with a name brand commercial program, especially if the disk rattles during the load. Don't worry if you don't want your drive to rattle during the check; the program has been written to avoid rattles. If you want to use the no rattle routine for other things, just list line 5 and replace the ONAGOSUB7,8,9 with CLOSE15. Then type NEW, go up, delete the line number, and press RETURN. The drive light will appear for a second. Now load your own program. One message of warning: Put a write-protect tab on every disk you want to check. This program has a tendency to make errors of its own. This rarely happens though, so don't worry. —Myong Paek

Portland, OR

```
1 CLR:A=53280:POKEA,.:POKEA+1,.:PRINT"[CLEAR][GREEN][DOWN]DISK ERROR CHECKER:":PRINT"[DOWN][DOWN][RIGHT]1. CHE";
2 PRINT"CK WHOLE DISK":PRINT"[DOWN][RIGHT]2. QUICK CHECK":PRINT"[DOWN][RIGHT]3. CHECK 1 TRACK"
3 PRINT"[DOWN][RIGHT]4. EXIT/END":INPUT"[DOWN][DOWN]YOUR CHOICE";A:IFA<1ORA>4THEN1
4 PRINT"[3"[DOWN]"]INSERT DISK TO CHECK.":WAIT198,1:PRINT"[DOWN][DOWN]CHECKING[3"."][DOWN]":IFA=4THENEND
5 OPEN15,8,15:PRINT#15,"M-W";CHR$(106)CHR$(0)CHR$(1)CHR$(133):ONAGOSUB7,8,9
6 CLOSE15:POKE198,0:PRINT"[DOWN]ERROR CHECKING COMPLETE.":WAIT198,1:GOTO1
7 FORT=1TO35:GOSUB11:FORS=0TOLS:GOSUB13:NEXT:NEXT:RETURN
8 FORT=1TO35:S=0:GOSUB13:NEXT:RETURN
9 POKE198,0:INPUT"WHICH TRACK (1-35)";T:IFT<1ORT>35THEN9
10 GOSUB11:FORS=0TOLS:GOSUB13:NEXT:RETURN
11 LS=16:IFT<31THENLS=17:IFT<25THENLS=18:IFT<18THENLS=20
12 RETURN
13 OPEN2,8,2,"#":PRINT#15,"U1,2"0;T,S:INPUT#15,E,E$,T$,S$
14 IFE<>0THENPRINTE"[LEFT],"E$","T$","S$
15 CLOSE2:RETURN
```

BORDERLINE

Do you have programs that wait for a key to be pressed before continuing on their merry way? Some people call

it a refreshing pause. Personally, if nothing is happening on the screen, I call it nap time. If you feel like I do, and want to add some spice to those pauses, try *Borderline.*

Borderline adds a multitude of colorful stripes to your monitor's border. The stripes move continuously downward until the user presses a key. There are versions for the C-64 and the C-128.

Just add *Borderline* to your own programs. Whenever you want the border to begin its colorful scroll, have your program SYS 700 for the C-64 or SYS 3072 for the C-128. For example:

```
100 SYS 700
```

will activate *Borderline* until a key is pressed. For the C-128,

```
100 BANK 15:SYS 3072
```

will do the job. BANK 15 insures proper activation (just in case the bank configuration was previously switched).

On both computers, the value of the keypress is returned in location 251. So, if your program is using *Borderline* in lieu of a GET statement, a line such as

```
110 PRINT PEEK (251)
```

will let your program know what key was pressed.

Borderline can be activated in direct mode also. SYS 700 [RETURN] will activate the C-64 version. BANK 15:SYS 3072 [RETURN] will activate it on the C-128. (Once again, BANK 15 is a precaution.)

Both versions of *Borderline* can be relocated by changing S in line 1. Remember to SYS to the new location if you do change it.

—Buck Childress
Salem, OR

64 VERSION

```
•1 S=700:REM *** CHANGE S TO RELOCATE ***
 C-64 VERSION ***
•2 PRINTCHR$(147):PRINT:FORJ=STOS+20
•3 READA:POKEJ,A:X=X+A:NEXTJ:IFX<>3473THE
 NPRINT"ERROR IN DATA[3"."]":END
•4 PRINT"THE DATA IS LOADED[3"."]":PRINT:
 PRINT"SYS"S"TO ACTIVATE[3"."]":END
•5 DATA32,228,255,240,3,133,251,96,238,32
 ,208,162
•6 DATA90,202,208,253,141,18,208,240,235
```

128 VERSION

```
•1 S=3072:REM *** CHANGE S TO RELOCATE **
 * C-128 VERSION ***
•2 PRINTCHR$(147):PRINT:FORJ=STOS+20
•3 READA:POKEJ,A:X=X+A:NEXTJ:IFX<>3468THE
 NPRINT"ERROR IN DATA[3"."]":END
•4 PRINT"THE DATA IS LOADED[3"."]":PRINT:
 PRINT"SYS"S"TO ACTIVATE[3"."]":END
•5 DATA32,228,255,240,3,133,251,96,238,32
 ,208,162
•6 DATA85,202,208,253,141,18,208,240,235
```

THE GREAT ESCAPE

The Commodore 128's BASIC 7.0 is full of features, but the usefulness of some is not apparent. From immediate mode, one can hit the ESCape key and then either a 'W' or 'V'. These two ESCAPE commands control the scrolling capabilities of the screen or window. The 'W' scrolls the screen downward every time the ESCape key and 'W' are entered. The opposite holds true for the 'V' command: the screen scrolls up. These commands do not seem helpful from immediate mode, but from within a program one can accomplish many things.

By entering the program example below, one can see these two commands at work. The program displays the phrase ">>> G A M E O V E R <<<" at the top of the screen. Next the phrase is moved to the bottom, then to the top again. This procedure repeats until the phrase is centered on the screen. To initiate an ESCAPE command from within a program, the "CHR$(27)" must be used before issuing the command. The ASCII value 27 turns on the ESCAPE mode on the C-128.

```
•1 A$="[3">"] G A M E  O V E R [3"<"]"
•2 A$=LEFT$(A$,40)
•3 L=LEN(A$)
•4 TB=INT((40-L)/2)
•5 SCNCLR
•6 CHAR,TB,0,A$
•7 S=24
•8 DO WHILE S>0
•9 FOR I=1 TO 2
•10 FOR J=1 TO S
•11 PRINT CHR$(27);
•12 IFI=1THEN PRINT "W";: ELSE PRINT "V";
•13 NEXT J
•14 S=S-1
•15 NEXT I
•16 LOOP
•17 END
```

To make the phrase start from the bottom of the screen and move in the opposite direction, change lines 6 and 12 to

```
6 CHAR,TB,24,A$
12 IF I=1 THEN PRINT "V"; : ELSE PRINT "
W";
```

—Michael Jaecks
Alamogordo, NM

WAIT A MINUTE

For those who write BASIC games which require a joystick—after you have set up the game and want the player to press the joystick button to begin the game, use the following statement:

```
WAIT 56320,16,240
```

This command is better than the common method of using a variable to PEEK the port and the AND operator to mask all but Bit 4. You can change it to WAIT 56321,16,240 and

the computer will wait for the pressing of the fire button of a joystick plugged into Port 1.

—Joshua Guy
Springfield, IL

THE CURTAIN EFFECT

Without a boring explanation, here is a machine language routine that when called from your BASIC program (using SYS LOC) will clear the standard Commodore 64's screen in an exciting new way! It does it in a fashion much like opening a set of curtains. Type it in and see!

—Andrew Vajoczki
Brantford, ONT

```
·100 LOC = 50000:REM - FULLY RELOCATABLE
·125 FORT=0TO103:READA:CH=CH+A:POKELOC+T,
 A:NEXT
·135 IF CH<>15839 THEN PRINT"ERROR IN DAT
 A":STOP
·140 SYS LOC:REM - USE ANYWHERE IN PROG.
·1000 DATA 169,0,72,169,0,133,251
·1001 DATA 169,4,133,252,169,0,133
·1002 DATA 253,169,216,133,254,162,0
·1003 DATA 160,1,177,253,72,177,251
·1004 DATA 136,145,251,104,145,253,200
·1005 DATA 200,192,20,208,239,136,169
·1006 DATA 32,145,251,160,38,177,253
·1007 DATA 72,177,251,200,145,251,104
·1008 DATA 145,253,136,136,192,18,208
·1009 DATA 239,24,165,251,105,40,133
·1010 DATA 251,165,252,105,0,133,252
·1011 DATA 24,165,253,105,40,133,253
·1012 DATA 165,254,105,0,133,254,232
·1013 DATA 224,25,208,182,104,168,200
·1014 DATA 152,192,20,208,155,96
```

INVISIBLE CHARACTERS

I have found that placing a keyboard graphic character immediately after the line number permits indentation of the BASIC line. For example, type in the following line:

```
10[s I][10 " "]REM
```

When you list the program, you will find that the REM has been indented eleven spaces. The SHIFTed character counts as one space, although it is invisible. Any keyboard graphic character obtained from using the SHIFT key or COMMODORE key can be used after the line number. Also, any executable line (such as one that starts with PRINT) can be indented and executed normally.

If you prefer just to have a blank line as a divider in your program, type a graphic character after the line number, then a space, and finally another graphic character. As an example, type in this line:

```
10[c R] [s P]
```

If you list the new line and position the cursor anywhere on that line, you may hit RETURN to delete it. By hitting RETURN on any other line, you will only return it to its normal unindented state.

If you want structured listings and own a Commodore 128 or C-64, I am sure you will appreciate this technique.

—Michael Jaecks
Alamogordo, NM

DLIST

The program above will allow you to list another program directly to the screen without having to go through the tedious process of saving your current program and then loading the program you wish to view. Just add this routine to whatever program you are currently working on and issue the command RUN 5000. After a brief moment the utility will ask for the name of the program you wish to see. Make sure the program is on the disk that's in the drive.

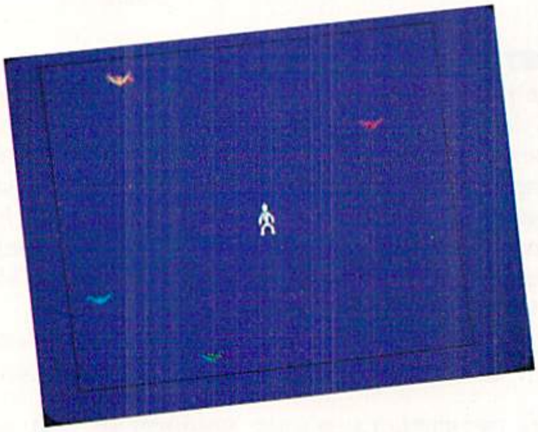
—Clifford Dedmore Jr.
FPO San Francisco, CA

```
·5000 PRINT"[CLEAR]ONE MOMENT[3"."]":POKE
 49,PEEK(47):POKE50,PEEK(48):DIMT$(77):T=
 1:FORK=41118TOK+256
·5010 IFPEEK(K)>127THENA$=A$+CHR$(PEEK(K)
 -128):T$(T)=A$:T=T+1:A$="":GOTO5030
·5020 A$=A$+CHR$(PEEK(K))
·5030 NEXT:O$=CHR$(0)
·5040 CLOSE15:OPEN15,8,15:INPUT"[CLEAR]PR
 OGRAM TO LIST";A$:OPEN2,8,2,""+A$:GOSUB5
 140
```

Continued on page 97

SPRITESHELL 128

By Cleveland M. Blakemore



The C-128 has a really terrific BASIC interpreter: in fact, BASIC 7.0 is almost as advanced as IBM BASICA, or even ABASIC for the Amiga.

The C-128 has a number of built-in commands that will produce arcade-quality games in the hands of the right programmers. But the commands have a number of critical drawbacks that limit the user to all but the simplest of games, depriving less advanced 128 owners of some of the game programming fun for which they would otherwise need to learn machine language. While I am a real whiz with assembly language, I do not expect everyone to learn it in order to enjoy the creative pleasure of making games on a computer!

A good example is *Planet Duel,* published in the April 1987 *Ahoy!* The game is really quite good for BASIC, but it suffers from a speed problem—and it would benefit greatly from keeping the sprites on the screen. Because the motion of sprites on the C-128 is interrupt-driven, they have the nasty habit of becoming "rogues" while BASIC processing is occurring during the game. They wander offscreen, collide, or even wrap around the playing area before BASIC can get around to checking their positions.

Obviously, what is needed is some kind of shell, an interrupt-driven program that will monitor the software-driven interrupt like a watchdog keeping the sheep in the pasture, saving the shepherd time he would normally waste doing the job himself!

When I sat down to write a program to cure these problems, I compiled a short list of the major annoyances involved with BASIC 7.0, and designed my machine language program, *Spriteshell 128,* around them:

1. Sprites tend to wander offscreen while a game is in progress.

2. SPRSAV is too slow a command to toggle different shapes for animation. POKE is not much better.

3. Joystick-driven movement for two players is too slow for any games which need the sprites to stay within certain boundaries.

4. Player missiles (laser beam, custard pie, bullet, etc.) need to be turned off when they reach playing area boundaries so that they do not wrap around.

5. The program must be capable of determining which screen is in use, either the graphics area or the text screen.

6. The program must fit unobtrusively into an area which will not interfere with the memory set aside for sprites by the C-128's operating system.

The interrupt-driven program requires a little over 500 bytes and resides at location 4864 in the memory space normally reserved for "function key software," to quote Jim Butterfield's memory maps. If you BLOAD the object code into memory at the beginning of your program, you will be ready to utilize features like joystick-controlled sprite motion (for one or two players), complete control of sprite positioning to keep selected sprites within borders, interrupt-driven sprite animation at speeds which you can set, and even position checking to turn off certain sprites when they touch the borders you have designated!

The machine language routine has five entry points that should be set up correctly before you start the interrupt, respectively called XB, YB, SPRTG, FLAGS, and CFLAGS. Make sure you always specify *all* parameters when SYSing to these entry points, or the computer may place random values in the neglected locations. Each entry point is described below, along with its parameters.

```
XB=HEX$(14D5)/DEC("5333")
```

(Used to set the maximum X-coordinate limits on the left and right.)

```
FORMAT:SYS XB,XL,XR
```

where XL=the left limit X coordinate border that you want the sprites to stop at from coordinates 1 to 255, and XR=the right limit X coordinate border, from 1 to 255. (The program assumes your limit is on the other side of the X-MSB line on the screen. If you want to set the right coordinate limit as close as possible to the X-MSB, then let XR=2.) Possible values such as XL=24, XR=65 will put the limits on the furthermost visible edges of the screen.

```
YB=HEX$(14DC)/DEC("5340")
```

(Used to set upper and lower Y-coordinate limits.)

```
FORMAT:SYS YB,UL,LL
```

where UL=upper limit Y coordinate border (1-255), and LL= lower limit Y coordinate border (1-255). It is wise to make UL less than LL to avoid funny results on the screen. Possible values could be UL=50, LL=229 to place the borders on the furthermost visible edges of the screen.

```
SPRTG=HEX$(14E3)/DEC("5347")
```

(Used to set the speed, number of sprites, and sprite blocks

PHOTO: MICHAEL R. DAVILA

to be used for interrupt-driven toggling of sprite shapes.)

```
FORMAT:SYS SPRTG,TS,TN,SB
```

where TS=speed at which you wish to toggle the sprites between two shapes, and TN=number of sprites to be toggled. Sprites one and two are not toggled so that they may be used either for two players or a player-missile combination. Setting TN to six, the maximum, will toggle sprites three through eight. SB will be the number of the sprite block base of two shapes to be toggled. This number will be the first of two shapes in memory that will be toggled. You have to supply the sprite data at the given memory location, 128 bytes of data that should start at SB*64 in memory. A good location would be 56, the beginning of the C-128's allocated memory for sprites. Setting SB to 56 will toggle the sprite shapes between 56 and 57, the shapes present in SPRITE 1 and SPRITE 2 when in SPRDEF mode.

```
FLAGS=HEX$(14F5)/DEC("5365")
```

(Used to activate joystick movement and sprite toggling, and set the number of players using interrupt-managed joystick movement.)

```
FORMAT:SYS FLAGS,OF,NT,NP
```


where OF=a zero or non-zero value. A non-zero value in this location turns on joystick-controlled movement, and a zero value turns it off. This is useful for eliminating movement at certain times during the course of the game—for example, right after the player's spaceship is destroyed. NT is also either a non-zero or zero value to turn sprite toggling on or off respectively. NP is the number of players you want to use interrupt-driven joystick movement, where 0 means you want one player controlling sprite number one with joystick 2, or 1 signifies two players using joystick ports 1 and 2 to control sprites one and two. When you want to turn on joystick movement, sprite toggling and two-player joystick-driven motion, SYS FLAGS,1,1,1.

```
CFLAGS=HEX$(14FF)/DEC("5375")
```

(Used to denote the sprite involved in collision checking, and the number of sprites that are to be kept in the "corral" you set with SB & YB.)

```
FORMAT:SYS CFLAGS,SC,NS
```

where SC=the number of the sprite (minus 1) that you wish to turn off whenever it collides with one of the borders set in either XB or YB, and NS=the number of sprites (minus one) that you wish to be involved in border checking. To keep all sprites within borders, set NS=7. Setting NS to zero will only keep sprite one within the designated borders. Normally you would SYS CFLAGS,1,7 if you wanted to have a one player game with sprite one using sprite two as a missile. Whenever sprite two touches one of the borders, it will be turned off. This really comes in handy for *Space Invaders*-type games where your laser fire is continuously moving offscreen and threatening to wrap around. Using this command will turn the missile off whenever it reaches the border you have set with XB or YB. To disable this feature, use any number higher than seven for SC.

When you have entered all these entry points with the appropriate values, SYS SHELL (HEX $1300/DEC 4864) to start at the interrupt routine. It may sound complicated, but it's really quite simple.

One important point to note about the border checking is that sprites will be kept within the screen limits you have set, but they will not stop moving. If sprite five is moving diagonally and it hits the Y-coordinate border, it will continue creeping along the border in the direction it was headed previously on the X-axis. Thus, screen action won't come to a standstill whenever there's a collision with the border.

The sprites will vibrate when they hit the borders, because the C-128's routine is trying to move them off, while *Spriteshell* is trying to keep them on. At the higher sprite speeds (12+) set with the MOVSPR command, the vibration will be very rapid.

Note that two-player joystick movement is slower than one-player, because the interrupt is servicing each player's port on alternate turns. It should not pose any problem.

The program assumes you are using the GRAPHICS screen if you have any graphic mode enabled other than

Continued on page 72

PS TO GEOS

For the C-64

By Shawn K. Smith

Print Shop Graphics to GEOS, or *PS to GEOS* for short, adds another dimension to the world of *GEOS*. *PS to GEOS* will allow you to import graphics designed for Broderbund's *Print Shop* into a format that can be used by other *GEOS* applications, such as *geoWrite* and *geoPaint*. And the graphics can be the ones offered by Broderbund or those offered by third party software houses such as Epyx.

ENTERING THE PROGRAM

PS to GEOS consists of two programs. This division is necessary to make it into a full blown *GEOS* application with icon. The first listing on page 95, PS TO GEOS.ML, should be entered with *Flankspeed. Ahoy!'s* mistake-free machine language entry program found on page 79. Be sure you understand how to use it before entering PS TO GEOS.ML. After you have typed in the listing, save a copy on your *GEOS* work disk. The second listing, BINARY TO GEOS, is written entirely in BASIC and should be entered as usual. It is not necessary to save this program on your *GEOS* work disk, but do save a copy for future use (hint!).

Once you have entered both programs, load BINARY TO GEOS, insert the *GEOS* work disk with PS TO GEOS.ML in the drive, and run the program. Answer the "ENTER NAME OF BINARY FILE" prompt with the name that you used to save PS TO GEOS.ML. After a short duration, *PS to GEOS* will be created, replacing the ML file created by *Flankspeed*.

DRIVING THE PROGRAM

PS to GEOS can be loaded by double clicking its icon from the *GEOS* deskTop. The first dialog box tells you to insert a *Print Shop* graphics disk. The next asks you to enter the name of the graphic you want converted. If you are unsure of the name, press RETURN and the names will be displayed one at a time until you see the one you are looking for. After choosing a name, you are told to place a *GEOS* work disk into the drive. Then the graphic is converted into *GEOS* format and saved in a Photo Scrap file. Note: if the disk contains a Photo Scrap file with information you wish to keep, save it in a Photo Album or rename the file before using *PS to GEOS*.

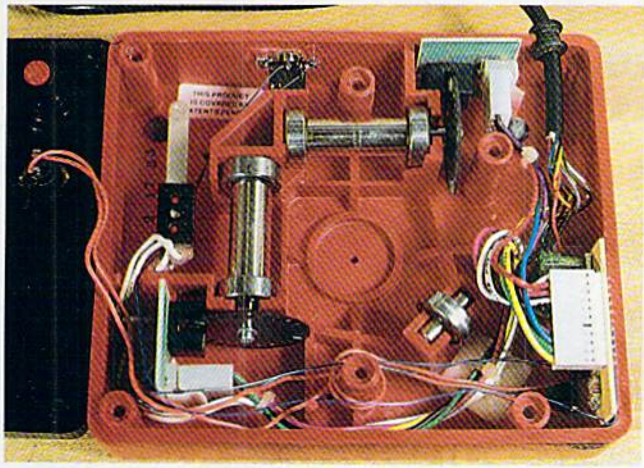
As with all other *GEOS* applications, *PS to GEOS* will reload the deskTop when it's finished.

Give *PS to GEOS* a drive, and I'm sure you'll agree that it does handle itself well in *GEOS*' world. ☐

SEE PROGRAM LISTING ON PAGE 95

ROLLING YOUR OWN: TURNING YOUR TRACKBALL INTO A MOUSE

By Morton Kevelson



A Zebra-modified WICO trackball. The white connector (lower right) is from the optical encoder boards above and left. The associated circuit board has been replaced. The mouse adaptor jack is at top, left of center.

PHOTO: MORTON KEVELSON

PARTS LIST

One 4093B Quad 2-Input NAND Schmitt Trigger (CMOS)
Four 12000 Ohm resistors
One 100 Ohm resistor
One 1N4001 Diode
One Joystick extension cord (Radio Shack 276-1978)
Miscellaneous: IC socket, circuit board, push button

Last month we reviewed the Amiga-modified trackball from Zebra Systems. In view of Zebra's limited supply, and since many of you may already own a trackball which is only gathering moss, we decided to present the details on doing the conversion yourself. Although the circuit is not complex, you will need some skill in electronic construction. You may also need an ohmmeter, or circuit continuity tester, along with the knowledge of how to use it. The accompanying schematic presents the circuit. If you have no problems following it, go ahead. As always, we make no guarantee as to the outcome of this project. You must assume all the risks of damage to your trackball or your computer.

This circuit should work with any Wico trackball. To our knowledge all the Wico trackballs have the same basic hardware. The various models differ only in their electronics, which gives them their computer-specific characteristics. We will be replacing the electronics with our own. We will also show how a second joystick connector should be installed on the trackball to allow the use of the mouse buttons in parallel with the trackball buttons.

Disassembly

Opening up the trackball is simply a matter of turning it over and removing the six recessed Phillips head screws. Hold or tape the two halves of the case together so that it does not open while it is upside down. The ball is heavy and probably adverse to impact, and the roller bearings are spring mounted. These parts tend to leap out of the trackball under the influence of gravity. If you open the trackball while it is inverted, you will probably never get to see it in its original state.

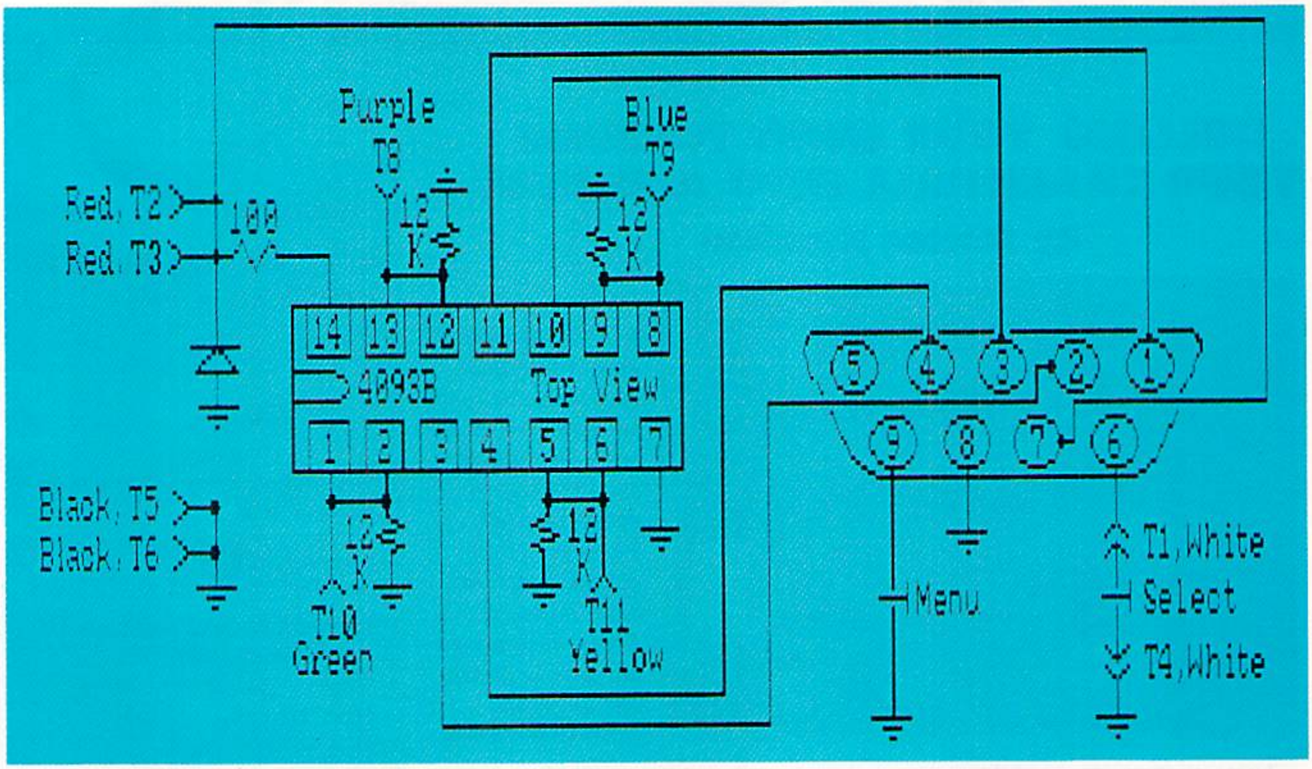
Carefully examine the insides of the trackball, taking note of all the components and their locations. Notice that the ball rests on three roller bearings. The single bearing roller in the lower right corner is an idler bearing. Each of the two larger bearings, one at the top and one to the left, have a black slotted wheel attached to the end of the shaft. Observe that each of these wheels passes through a black "U" shaped assembly mounted on a small circuit board. These are the optical sensors which convert the rotational motion of the wheels into a series of electrical pulses. There are actually two optical sensors in each assembly. The mechanical spacing of these sensors generates a series of pulses which may be decoded to yield both the speed and direction of rotation of the trackball.

Each optical assembly is equipped with a four wire connector. If you follow the wires you will see that they terminate in an 11 pin connector which also contains the two wires from the trackball's push button. The optical assembly at the top translates vertical rotation of the ball. The sensor to the left translates horizontal rotation.

If your trackball has two push buttons, the wires from the second button will be terminated separately. The cable assembly is terminated on a 1½ by 2" circuit board fitted into a pair of slots at the lower right hand corner. The joystick cable is terminated here as well. This circuit board will be removed and replaced by the circuit on the accompanying schematic.

Assembly Notes

If you are using an Atari style trackball you will have to replace the joystick cable. The Amiga mouse requires eight wires in the joystick cable, one more than in the cable supplied with the Atari version. We suggest using a 10' joystick extension cable for this purpose. Before cutting this cable in two, give some thought to the length of wire you will need for your setup. The female connector will be used for the Amiga's mouse port. The male connec-



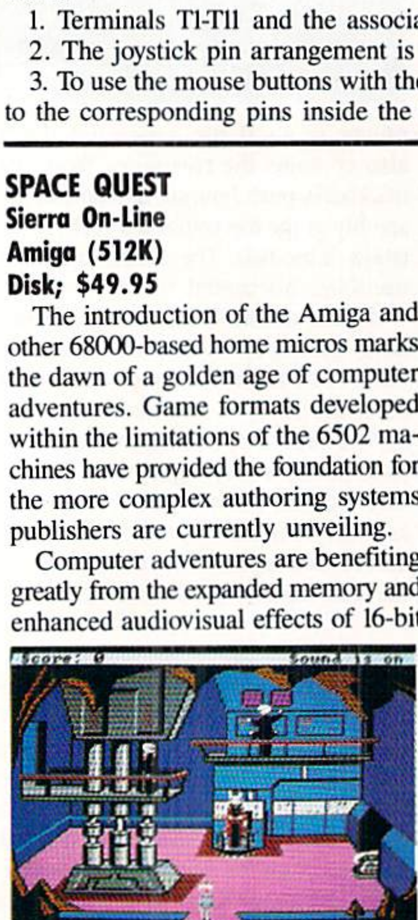
Notes:

1. Terminals T1-T11 and the associated wire colors correspond to the wiring of the trackball's internal connector.
2. The joystick pin arrangement is viewed from the end of the cable which is terminated in the female connector.
3. To use the mouse buttons with the trackball, connect pins 6, 8, and 9 of the cable terminated in the male connector to the corresponding pins inside the trackball.

SPACE QUEST
Sierra On-Line
Amiga (512K)
Disk; $49.95

The introduction of the Amiga and other 68000-based home micros marks the dawn of a golden age of computer adventures. Game formats developed within the limitations of the 6502 machines have provided the foundation for the more complex authoring systems publishers are currently unveiling.

Computer adventures are benefiting greatly from the expanded memory and enhanced audiovisual effects of 16-bit computers such as the Amiga. Designers who once cut plots to the bone and nervously counted each animation for fear of exhausting memory can now create adventures which rival novels in depth and complexity.



Space Quest: *janitor in a conundrum.*
READER SERVICE NO. 172

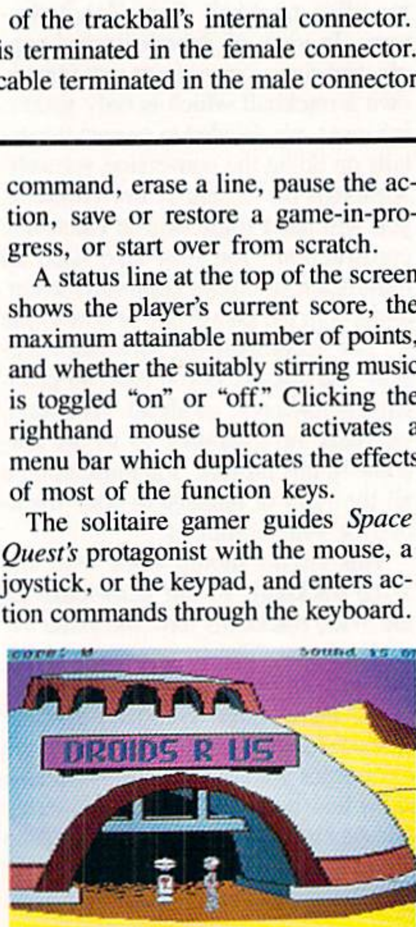
The play-mechanics of *Space Quest* is the latest permutation of the system Sierra introduced in 1984 in Roberta Williams' *King's Quest.* This groundbreaking fantasy epic blended outstanding animated illustration, a fluid joystick control system, and a parser to produce a dynamic, real-time gaming experience.

The Game System

Jeff Stephenson, who programmed this edition of *Space Quest*, was co-designer with Chris Iden of the overall system. It features pop-up text windows, multiple solutions to some of the puzzles, and pseudo-3-D animated graphics. The parser interprets compound sentences, which makes it easier to perform activities such as giving an item to another character. Function keys make it simple to repeat a command, erase a line, pause the action, save or restore a game-in-progress, or start over from scratch.

A status line at the top of the screen shows the player's current score, the maximum attainable number of points, and whether the suitably stirring music is toggled "on" or "off." Clicking the righthand mouse button activates a menu bar which duplicates the effects of most of the function keys.

The solitaire gamer guides *Space Quest's* protagonist with the mouse, a joystick, or the keypad, and enters action commands through the keyboard.



Touches of sarcasm and irony keep the adventure from getting too solemn.

MOUSEPORT

Pin	Function
1	Vertical
2	Horizontal
3	Vertical Quadrature
4	Horizontal Quadrature
5	Mouse Button 2 (not used)
6	Mouse Button 1 (left/select)
7	+5 Volts
8	Ground
9	Mouse Button 3 (right/menu)

TRACKBALL CONNECTOR

Wire	Color	Function
T1	White	Select push button
T2	Red	+5 Volt, vertical
T3	Red	+5 Volt, horizontal
T4	White	Select push button
T5	Black	Ground, horizontal
T6	Black	Ground, vertical
T7	(No connection)	
T8	Purple	Vertical #1
T9	Blue	Vertical #2
T10	Green	Horizontal #1
T11	Yellow	Horizontal #2

tor will be used for the mouse extension to which the Amiga mouse may be reconnected.

If you are installing a second push button, take careful note of the trackball's construction. Although there is plenty of empty space inside the trackball, there are numerous projections from the inside of its case. A possible location for the second button is right beneath the first and above the plastic cable clamp projection inside the case. If you are installing the mouse connector, a good place for the cable hole is directly below the existing cable. You should pass the entire cable through the hole, although only three wires are used for the mouse push buttons.

We will leave the actual layout of the circuit board to your own ingenuity. The schematic and the adjacent tables include the functions of and the wire colors for the trackball's wiring harness. We have also tabulated the functions of the Amiga's mouseport. We suggest you retain the original connector and use an 11 pin header (0.1 inch spacing) with your design. The total cost for parts for this project should be less than $10.00.

Instead of directly controlling the hero, the mouse, pad, or stick moves a small pointer around the screen. When the user holds down the left button, the figure on the screen moves toward the pointer. Another click causes it to stop in place. This system, though exceptionally straightforward, is not always easy to work. The novice can expect to spend some time running into door jambs, walls, and objects while learning to steer with precision.

The program's text output appears in the center of the screen in pop-up windows, which makes messages much easier to read than in adventures which print them in the same message box which accepts typed input. Hitting RETURN or clicking the appropriate controller button removes the latest block of text.

Illustration is excellent for the most part, but the main character could have more detail and move more naturally. A nagging problem is that there are no printed "room descriptions" as such in *Space Quest.* The computerist can use the parser to "look" at items or "examine" them and get a well-written explanation. Unfortunately, it isn't always easy to tell what an object is supposed to be or, worse, what the designers have called it. Sessions of "guess the word" disrupt the flow of the plot and may cause some frustration.

The Story

The Star Generator is a super-scientific device which can turn a lifeless planet into a new star. It represents nothing less than salvation to the people of Earnon, whose own sun is slowly dying.

Scientists on the governing planet Xenon, working on the spacelab Arcada, have just perfected the Star Generator. But before they can use it to rescue Earnon, the piratical Sariens strike! These renegades from Earnon swarm over the Arcada, kill everyone they meet, and try to carry the Star Generator to their battle cruiser Deltaur.

And you? Why, you're a janitor on the Arcada. While you slumber in a storage closet, ducking your work as usual, the Sariens launch their attack. With most of the crew and scientists dead, it's up to you to save the day! To win *Space Quest*, the hero must escape the Arcada with his life, visit the planet Kerona, meet a society of super-intelligent subterraneans, and penetrate the Sariens' battle cruiser.

The attitude of designers Scott Murphy and Mark Crowe toward their subject matter can be guessed from the fact that they call their team "Two Guys from Andromeda." Sarcasm and irony keep *Space Quest* from getting too solemn and inspire the gamer to the kind of freewheeling action which meshes perfectly with the style of the story. The overall mood can be likened to movies such as "Star Wars" and "Raiders of the Lost Ark," with a somewhat greater emphasis on humor.

Space Quest is involving, challenging, and sometimes even laugh-out-loud funny. It's a potent mixture calculated to provide many hours of entertaining adventuring for Amiga owners.

Sierra On-Line, P.O. Box 485, Coarsegold, CA 93615 (phone: 209-683-6858). *—Arnie Katz*

DISK-2-DISK
Central Coast Software
Amiga with 1020 Disk Drive
Price: $49.95

In the June 1987 issue we described a method for the bidirectional transfer of files from 1541 format disks to Amiga format disks (*C-64 to Amiga File Transfer*, p. 51) which did not require the use of a telecommunications channel. The procedure required a C-128 computer with a 1571 disk drive, an Amiga with a 1020 disk drive, *DOS-2-DOS* from Central Coast Software, and *Big Blue Reader* from S.O.G.W.A.P. Software. In the same issue we included reviews of both the aforementioned format conversion programs.

At the time we felt we were pretty clever putting together such a diverse collection of hardware and software to solve a common problem. In fact, Commodore also thought the idea was clever, as they intend to distribute copies of the article to all their dealers as an example of the versatility of both computer systems. As a result we were somewhat nonplussed by the arrival of a review copy of *Disk-2-Disk* from Central Coast Software. It seemed as if Central Coast Software had gone ahead and eliminated the need for our carefully choreographed procedure with a single disk. We did breathe a small sigh of relief as we noted that this time the ink had a chance to dry on our report before we had to start again.

In brief, *Disk-2-Disk* eliminates the intermediate step (using the IBM disk format) in our previous article. *Disk-2-Disk* endows an Amiga and a 1020 disk drive with the ability to read and write 1541 format or 1571 format disks.

Unlike *DOS-2-DOS*, which employs a command line user interface, *Disk-2-Disk* has adopted a full-blown Amiga-style, mouse-driven, gadget-laden operating window. Directories from both the source and destination disks are automatically displayed in their respective windows. Files are selected by pointing and clicking. The keyboard is used only for changing file names or entering the wild card characters for batch operations.

Four types of file transfers are provided. One is a direct transfer without any data conversion. The next two involve the translation of PETSCII to ASCII. The translation may be done from upper/lower case PETSCII or from upper case/graphics PETSCII. The file translation also includes the conversion of all carriage returns (CHR$(13)) on the 1541 side to linefeeds (CHR$(10)) on the Amiga side. As a rule the C-64 uses the carriage return as a paragraph marker while the Amiga requires a linefeed. Interestingly enough, this last feature is not mentioned in any of the documentation which accompanied *Disk-2-Disk*.

The fourth type of file transfer is for use on BASIC 2.0 or BASIC 7.0 files which have been saved as sequential text files. This translation does several things. To begin with, spaces are inserted between all BASIC keywords. These spaces are required by AmigaBASIC, but are on optional on the C-64 or C-128. Next, all BASIC keywords which are not valid in AmigaBASIC are flagged by preceding them with a REM***. These steps give you a good start towards converting the file to AmigaBASIC. Finally, a BASIC program icon is created for the file.

Disk-2-Disk recognizes all of the 1541 file types. The only limitation is with relative files, where *Disk-2-Disk* ignores the side sector data.

Disk-2-Disk is even able to format 1541 single sided or 1571 double sided disks. However, there are some significant limitations to what can be done with the Amiga 1020 when it comes to formatting and writing to a 1541 format disk. Most other disk formats read and write data from and to the disk at a constant rate. This means that each track will contain the same amount of data even though simple geometry shows that the outer tracks of a disk are physically longer than the inner tracks. Thus for most disk formats the data density on the disk varies with the track with the highest density at the center of the disk.

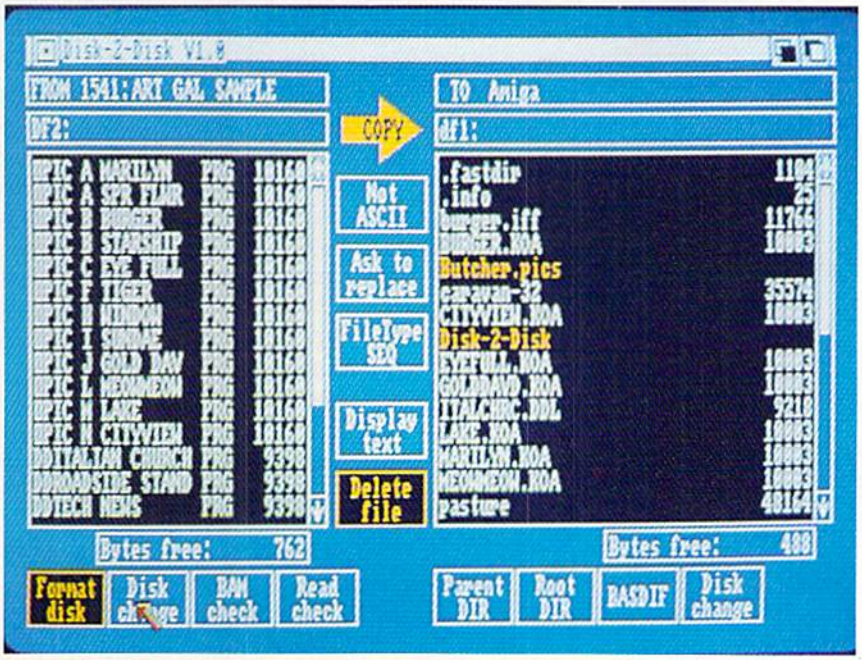
The 1541/1571 reads and writes data from and to the disk at varying rates, four different rates to be exact. The fastest data rate is associated with the outer tracks (1-17). The slowest data rate is used on the inner tracks (31-35). Intermediate data rates are used for tracks 18-24 and 25-30. As a result the outer tracks of a 1541 disk contain more data than the inner tracks. This is generally referred to as variable density recording, a term which is somewhat misleading. A better description would be variable rate recording. in fact the data density between the inner and outer tracks, as recorded on a 1541 formatted disk, is actually more uniform than the densities which result from constant data rate recording.

What it all comes down to is that due to hardware limitations of the Amiga 1020 disk drive, *Disk-2-Disk* will only format tracks 18-35/53-70 on a 1541/1571 format disk. When writing to the disk, preference is given to tracks 18-35 with tracks 1-17 being reserved for the last. On the other hand there does not seem to be a similar limitation going in the other direction. *Disk-2-Disk* is perfectly capable of reading any track on a 1541 format disk. This means that the largest files which can be transferred from the Amiga to a 1541 disk which is formatted by *Disk-2-Disk* have to be less than half the capacity of the 1541 disk.

Within the aforementioned limitations, *Disk-2-Disk* provides for substantial control of the file transfer process. Text files may be viewed on the Amiga display. Since the various ASCII-PETSCII translations are in effect while viewing, the results can be used to determine which type of translation to use. On the 1541 side the format check scans a disk for errors. The BAM check verifies that all the files on a disk have been properly allocated in the block availability map.

Our tryout of *Disk-2-Disk* was not without problems. We were never able to get the 1541 format routine to work. Transfers from the Amiga to the 1541 seemed to fail about half the time. On the other hand transfers from the 1541 to the Amiga were done without any difficulty.

We spoke to Richard Chamberlain of Central Coast Software about these problems. He indicated that *Disk-2-Disk* was very sensitive to the disk media when writing or formatting in 1541 mode. Some disk brands would not work at all while other brands worked just fine. The only solution is to experiment until you find a brand that works. The recommended procedure is to preformat the disks on a 1541 or 1571 disk drive. Amiga files should be



The Disk-2-Disk *working window. 1541 files are to the left. Size of 1541 files is estimated using 254 bytes per block.* *READER SERVICE NO. 192*

transferred only to disks which contain non-critical data or to disks which have been previously backed up.

Mr. Chamberlain also indicated that the next release of *Disk-2-Disk* would contain some additional file conversion options. These would handle the conversion of word processor files which were saved using the C-64 screen codes instead of PETSCII. In particular, support is being provided for *PaperClip, Pocket Writer,* and *Speedscript.*

In conclusion, if you already have the setup which we described in *C-64 to Amiga File Transfer,* we see little reason to add *Disk-2-Disk* to your setup. If you do not have a 1571 disk drive or a C-128 computer, then *Disk-2-Disk* is your only option for direct disk transfers at this time. *Disk-2-Disk* will also be of interest to users who have traded in their C-64 for an Amiga. Due to the limitations of the Amiga 1020 disk drive when writing 1541 files, we recommend that *Disk-2-Disk* only be considered if your primary purpose is transferring files to the Amiga.

Central Coast Software offers one more option for users who do not own an Amiga 1020 disk drive. For a service charge of $15 per order plus $6.50 per disk they will convert your 1541 format disks to Amiga format disks. These prices include the 3.5" diskettes and return shipping via UPS surface. This service is intended for users with a limited number of files to transfer, which does not justify the investment in an Amiga 1020 disk drive.

Central Coast Software, 268 Bowie Drive, Los Osos, CA 93402 (phone: 805-528-4906). *—Morton Kevelson*

PHOTO: MORTON KEVELSON

BUTCHER
Eagle Tree Software
Amiga with 512K
Price: $37.00

Butcher may be described as a bit plane cleaver. However, such a description would be inadequate, as *Butcher* does far more than cleave bit planes. *Butcher* is a collection of image processing utilities for graphics saved in the Amiga's IFF format, of which bit plane cleaving is only one function. *Butcher* will work with all of the Amiga's standard graphic formats, ranging from single bit plane (two color), high-resolution/interlaced (640 × 400 pixels) image to six bit plane, hold and modify (4096 color) low-resolution (320 × 400) image. It will automatically adjust the display mode to accommodate the image format to be worked up.

The interface between the user and *Butcher* follows the Amiga's Workbench conventions. Access to all functions is through a collection of drop-down menus. Custom requestors are provided for all functions which require additional user input. Requestors are fitted with an ample supply of button and slider gadgets. Many functions can also be directly accessed by pressing

the Right Amiga key in combination with another key. We have included a table of *Butcher's* menu options as a quick summary of its functions.

can be done with a full-featured program such as *Deluxe Paint.* Of course the Draw function is only meant to be a convenience feature for minor adjustments. *Butcher* is not intended to be used as a drawing package.

BUTCHER'S MENU OPTIONS

Project	Tools	Process	Convert	Slice
Load	Undo	Edge	Histogram	400 to 200
Save	Draw	Filter	Quick Merge	200 to 400
Save As	Reverse	Mosaic	Auto Merge	640 to 320
Print	Flip	Slice Plane	Auto Chop	320 to 640
Print Part	Palette 1	Density Slice	Change Depth	
Ask Mode	Palette 2		Lo-res to HAM	
Title	Palette 3		HAM to Lo-res	
Clear	Make Palette			
Quit				

With a few exceptions the items in the first menu column should be familiar to users of any Amiga paint program. The Print Part function lets you select a portion of the image and dump it to the printer. Choosing the Normal option under the Print Part function will dump the selected part according to the Preferences setting with dimensions as if the entire image were being printed. Choosing the Enlarged option will dump the selected portion so as to fill the dimensions as set in Preferences. The Enlarged option should permit the printing of an image in sections for subsequent pasteup to a larger size. Unfortunately the portion selection process does not include a coordinate display, making precise selection of symmetrical portions difficult.

The Ask Mode options responds with the current display mode and the number of bit planes in the picture. Only standard size bit maps (320 × 200, 320 × 400, 640 × 200, 640 × 400, 320 × 200 HAM) were supported by the version of *Butcher* looked at. Pictures with other dimensions (brushes), Dual Playfield Mode, and Extra Half-Bright Mode cannot be modified by *Butcher.* Hold and Modify mode images may be converted to low resolution images and vice versa. However, most of *Butcher's* functions will not work directly on HAM images.

In the Tools menu the Draw function turns *Butcher* into a rudimentary bit map drawing program. The drawing functions include freehand sketching, lines, filled and unfilled boxes, and area fills. This is a long way from what

Butcher maintains three palettes for the current image. Palettes may be copied from one to another, or they can remain completely independent. The Make Palette function provides for the total control of the image's color content. There are the usual settings for the adjustment of individual colors via red, green, and blue or hue, saturation, and value slider gadgets. The colors may also be sorted in ascending or descending order according to their relative intensity. In *Butcher,* intensity is defined as the sum of the red, green, and blue values.

The Make Palette requestor also contains a set of generalized color controls. These controls affect the red, green, and blue content or the hue, saturation, and value of all the colors in the image. This makes it easy to quickly adjust the overall appearance of an image. The adjustment range of the generalized controls is from −15 to +15.

The process menu encompasses several *Butcher* functions. The Edge function mathematically determines which pixels are part of an edge. A threshold setting determines the sensitivity of the edge algorithm. A setting of zero will set an edge whenever a pixel differs from its neighbor. At the maximum setting edges are detected only between pure black and white pixels.

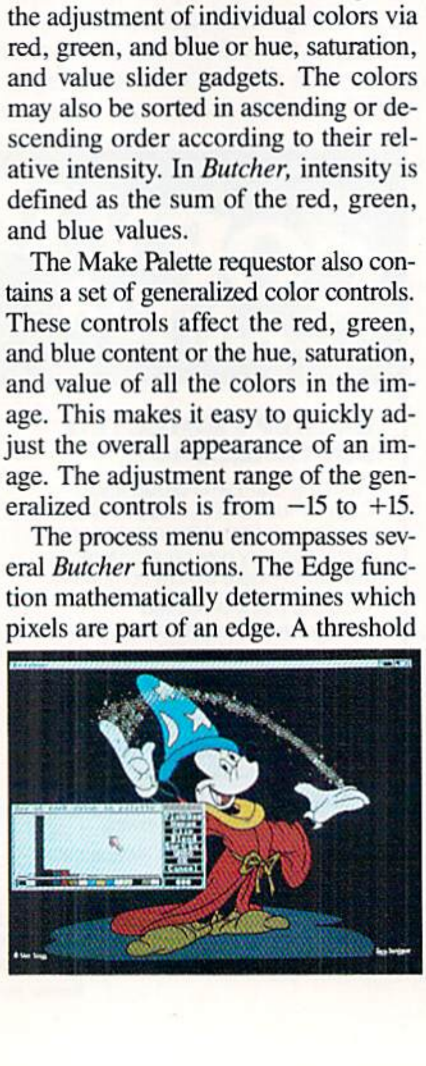
The Edge requestor offers several ways to display the image. The Map selection draws only the edges converting the picture into a line drawing. The map may be drawn in the darkest palette color against a background of the lightest color or in the reverse. Or the map may be drawn in the colors of the edge pixels. The Darkness slider adjusts the intensity of the selected edge colors. Choosing Enhance applies the edges to the picture itself.

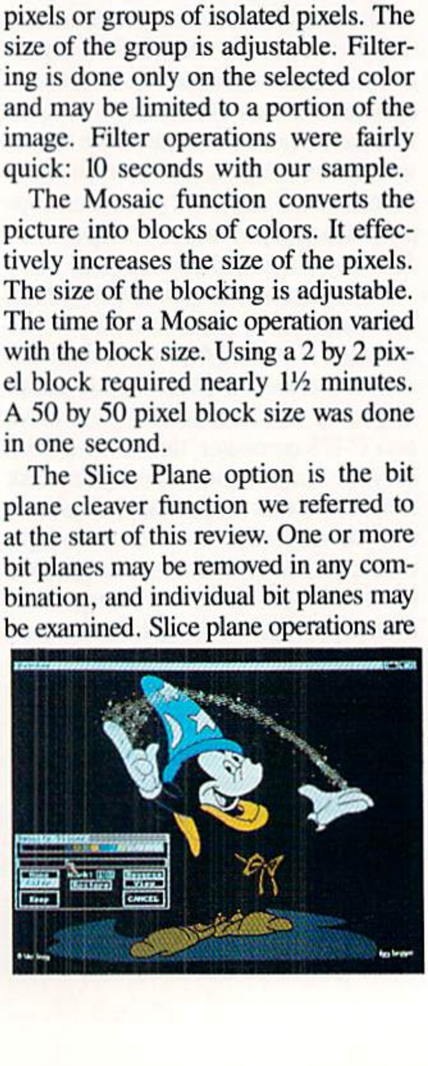
Map operations involve a large number of repetitive calculations which require a substantial amount of time. We used a four bit plane, 640 by 400 pixel image to estimate the time required for various operations. A monochrome map required nearly five minutes. A color map took approximately seven minutes.

The Filter function removes isolated pixels or groups of isolated pixels. The size of the group is adjustable. Filtering is done only on the selected color and may be limited to a portion of the image. Filter operations were fairly quick: 10 seconds with our sample.

The Mosaic function converts the picture into blocks of colors. It effectively increases the size of the pixels. The size of the blocking is adjustable. The time for a Mosaic operation varied with the block size. Using a 2 by 2 pixel block required nearly 1½ minutes. A 50 by 50 pixel block size was done in one second.

The Slice Plane option is the bit plane cleaver function we referred to at the start of this review. One or more bit planes may be removed in any combination, and individual bit planes may be examined. Slice plane operations are





practically instantaneous.

The Density Slice function treats the palette as a series of intensity levels ranging from black to white. Setting a point on this intensity scale results in a two color image. The set point may be slid up or down the scale. Density Slicing is a nearly instantaneous operation. The Density Slice Function supports two set points. If both are used the image may be divided up into four areas with each area a different color. The pseudocolors used by the Density Slice function are black, red, green, and yellow. Density Slicing may also be done in color. In this case the darker colors are progressively replaced with black as the slicing point is raised.

The Histogram function generates a pixel count for each color in the palette. The results are displayed as a bar graph of the relative totals. The Use button on the Histogram requestor gives an exact pixel count as well as a percentage of the total. The Histogram offers several options. A Merge operation changes all the pixels of one color into another. A Blend operation is similar to a merge except the resulting colors depend on the relative proportions of the original colors. The entire palette may also be sorted according to the number of pixels in each color. All operations can be performed on a selected portion of the image.

The Auto Merge function automatically merges, blends, and sorts the colors until the selected maximum number of colors has been achieved. The colors which are now devoid of pixels may now be redefined without changing the resulting image.

The Auto Chop function performs an Auto Merge till the number of colors in the palette has been reduced to fit in the specified number of bit planes. The Change Depth function discards bit planes without any regard for the resulting colors.

The remaining menu items are self-explanatory. Note that for best results the Auto Chop or Auto Merge functions should be used before using a Slice function, which will reduce the number of bit planes.

Butcher is designed to multitask with other Amiga programs, but we did encounter some bugs. An attempt to access Preferences to adjust the printer settings while running *Butcher* brought us a visit from the Guru. *Butcher* is not copy protected and can be easily transferred to other work disks. The program occupies less than 80,000 bytes of disk space. As a rule graphic operations are memory-intensive. Although additional fast RAM is not mandatory, it's recommended for work with high resolution images. *Butcher* maintains several copies of an image to support the various undo options.

Butcher is a useful tool that no Amiga Graphic artist should be without.

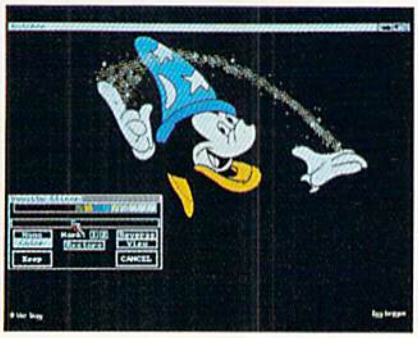
Eagle Tree Software, P.O. Box 164, Hopewell, VA 23860 (phone: 804-452-0623). *—Morton Kevelson*

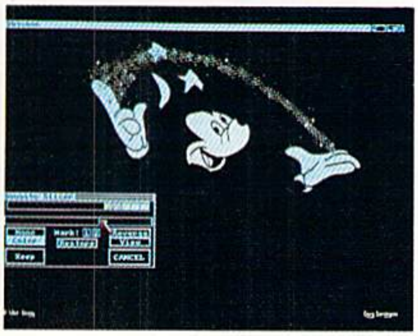


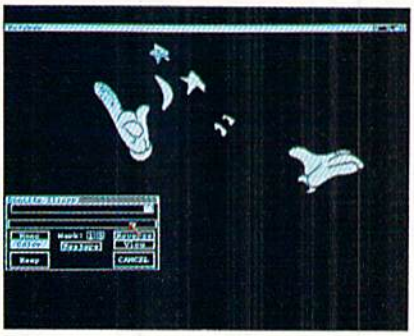


At extreme left is a sample Histogram, followed by a series of four successive steps of a Density Slice operation in color. The large image at left is an Edge/Map operation in color, while directly above is the result of a Mosaic operation.

READER SERVICE NO. 193







PHOTOS: MORTON KEVELSON

RED ALERT

For the C-64

By Tony Brantner

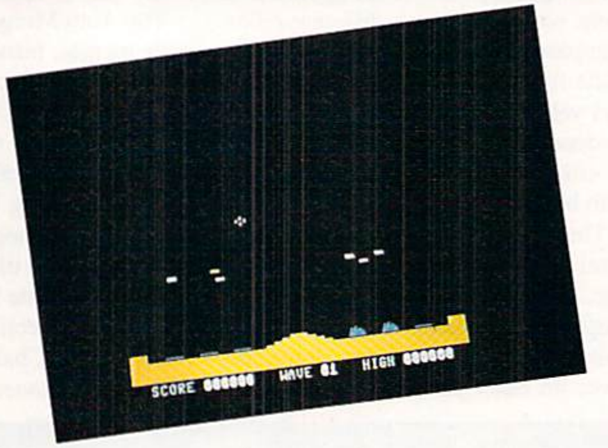


PHOTO: MICHAEL R. DAVILA

Red Alert takes its cue from the arcade classic *Missile Command.* The object of the game is to defend six cities and your missile base from the enemy missiles falling from the sky.

Use *Flankspeed* (page 79) to type in and save a copy of *Red Alert.* After loading the program, type SYS 49152 and press RETURN to start. At the lower center of the screen is your missile base. There are three cities on each side of the base which you have to defend. The score, current wave number, and high score are shown at the bottom of the screen.

Using a joystick plugged into Port 2, press the fire button to erase the flashing title and begin play. Above the missile base is a cursor. Use the joystick to move the cursor around the screen, and press the fire button to launch a missile from the base. The missile locks onto the coordinates of the cursor, and explodes when it reaches its destination. Any enemy missiles that are within range are destroyed. Once a missile is launched, you can move the cursor and get ready to fire another once the first is detonated. You earn 10 points multiplied by the current wave for each enemy missile destroyed.

Each wave consists of a random number of missiles being dropped. While it's important to protect the cities, protecting your missile base is essential. If the base is wiped out, you are helpless until the wave ends. At the end of the wave, you are awarded an additional 100 points for every city left standing. For every 10,000 points, a short tune plays, and you receive a bonus city. If all six cities are still standing, the bonus city is saved until you need it. There are a maximum of 20 waves, and you can toggle the SHIFT-LOCK key to freeze the game. ☐

SEE PROGRAM LISTING ON PAGE 89

S.O.S.

By Tim Little

Send your questions about any aspect of Commodore computing to *S.O.S.*, c/o *Ahoy!* Magazine, Ion International Inc., 45 West 34th Street–Suite 500, New York, NY 10001.

I have noticed that most of your *Flankspeed* listings chop off the end of the line, and won't enter correctly because of that. Also, why don't your ending addresses always correspond to the last line of your *Flankspeed* listings?

—Frank Dobson
Lubbock, TX

Flankspeed *is just a data entry program. You tell it where in memory to store a program, and then you enter all the data. The program actually stores the data and uses a rudimentary checksum formula to prevent most typing mistakes.*

Let us take this line as an example:

```
C000: A9 08 20 D2 FF 20 D5 C4 5F
```

The C000 is the hexadecimal address of the first byte of that row of numbers. The address of the second byte, 08, will thus be C001, the third byte, 20, will be stored at C002, and so on. The last byte on that line that will be stored is C4, which is byte C007. This leaves 5F, the last number on the line, unaccounted for. This number is the checksum. It allows Flankspeed *to make sure that what you just typed is correct.*

Thus, when you see an ending address at the start of the program listing, it refers to the address of where the last byte will be stored, which may or may not be the same as the number that is printed at the start of the last line. In fact, the only way you would have a full final line would be if the ending address were to end with either a '7' or an 'F.'

I have bought a few of the *Ahoy!* diskettes, and I have also entered a few programs from your magazine by hand. But when I try to LOAD any ML programs and RUN them, all I get is a syntax error in some line I didn't enter, or just the READY prompt.

When I try listing the program, all I get is garbage on the screen, or just the READY again. What am I doing wrong?

—Lynn Kidder
Albany, NY

All ML (machine language) programs must be loaded into the computer by typing

```
LOAD "filename",8,1 (disk)
```

or

```
LOAD "filename",1,1 (tape)
```

Notice the ',1' on the end; that is not optional with machine language programs. If you omit the ',1' and you try to execute the program or try just to list it, very strange things happen. The worst that could happen is that your computer will lock up, and you will have to reset it.

The correct way to execute these programs is to enter the proper SYS command after you have loaded them. The correct SYS number is printed in the magazine with the program, or in the article.

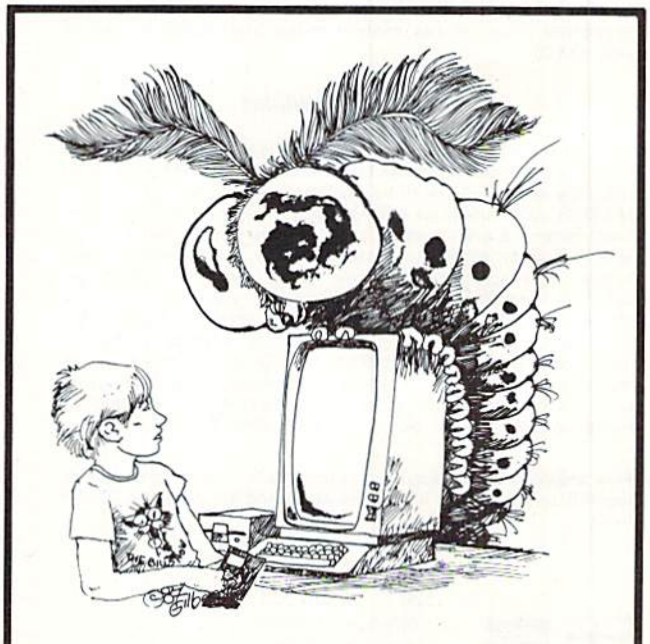
After having typed several issues' worth of programs into the computer, and having saved all of them onto my cassette drive, I find that I want to transfer them to my disk drive.

I have no problems transferring my BASIC *Ahoy!* programs, but how can I transfer my ML programs to disk from tape, or from one disk to another?

—Wally Levy
Tacoma, WA

To transfer from tape to disk, just LOAD and RUN Flankspeed. *Then enter the starting and ending addresses as printed with the program you wish to transfer. Then hit F3 to load the program. When done, just hit F1 to save it, and when prompted for [D]isk or [T]ape, enter D for disk.*

To transfer ML programs between disks, LOAD and RUN Flankspeed, *enter the starting and ending addresses and hit F3 to load the program, insert the disk with the program on it, and answer the prompts. Then when the program is finished loading, hit F1 to save it, insert the disk that you want to copy the program onto, and answer the prompts.*



Real Computer Bugs

Continued from page 40

C-128 version:

```
930 DRAW,RND(0)*320,RND(0)*200
```

PC version:

```
930 PSET(RND*320,RND*200)
```

Benchmark #10 draws 100 random lines. The two versions are listed with the C-128 version first:

```
1030 DRAW,RND(0)*320,RND(0)*200 TO RND(0
)*320,RND(0)*200
1030 LINE(RND*320,RND*200)-(RND*320,RND*
200)
```

Finally, Benchmark #11 draws 50 circles with random centers and random radii less than 50 units. The two versions are as follows with the C-128 version first:

```
1130 CIRCLE,RND(0)*320,RND(0)*200,RND(0)
*50
1130 CIRCLE (RND*320,RND*200),RND*50
```

If you are using the 40-column screen on the C-128, you should remove the GRAPHIC 5 statements from lines 950, 1050, and 1150.

The C-128 is slightly slower than the PC in plotting points and drawing lines, but it is much slower in drawing circles. Plotting points on a circle is a computation-intensive task. The six to one ratio in times could be because of different algorithms in the two machines. More likely it is because the 8088 processor in the PC has built-in multiply and divide operations which speed up the heavy calculations.

CONCLUSIONS

The conclusions are up to you. The C-128 has sound and sprite graphics features which the standard PC cannot touch, although the PC allows expansion boards to provide almost any capability imaginable. The C-128 in FAST mode runs BASIC programs at roughly the same speeds as the PC. Disk access on the IBM PC is much faster than on the C-128. Disk access speed of the PC10 may be slower than the IBM PC the tests were run on. For standard programming, the two classes of machines are quite comparable.

It should be noted that there is a new breed of interactive BASIC compiler available for the PC (Microsoft *Quickbasic* and Borland *Turbo BASIC)* which gives the PC a significant speed and debugging advantage over every BASIC interpreter on any machine. If you are a serious BASIC programmer, one of these compilers could be reason enough to buy a PC.

The biggest advantages of the C-128 over the PC are basic price, sound, and graphics. The PC's biggest advantages are its expandability, 640K of RAM, and the wealth of technical, high-quality software and hardware available. The PC can readily handle data and software many times larger than the C-128 can. Some programs on the PC come with help files larger than 200K bytes, for example. It should be noted that software for the PC is generally more expensive than C-128 software, since much of the PC software is geared for business use.

For the PC, programs listed at $99 are considered low-priced. The best-selling word processors for the PC list for $400 to $500, although they can be bought via mail order for roughly $200. Spreadsheet programs that cost $200 to $300 mail order are commonplace for the PC, although there are some that are closer to $100.

Hardware for the PC in some cases is less expensive than C-128 hardware. Double-sided floppy disk drives are typically about $100 for the PC. (Have you ever seen a 1571 for that price?) Hard disks storing 10 megabytes can be bought for under $300 for the PC. Memory expansion boards providing 256K bytes or more cost less than $150.

The PC10-2 lists for $1199 with 640K of RAM and two floppy disk drives. It can be found for under $900 from some stores. The C-128 and two 1571 disk drives still sells for over $700 from most sources. Obviously you can get in on the ground floor of computing less expensively with the C-128 (or the C-64), but if you plan to expand much above the basic system, the initial differences in price may not be so significant.

You get a lot of computer for the money with the C-128. From this article, hopefully you have a better understanding of the PC class of computers. The Commodore PC10 "clone killers" also provide a lot of computer for the money. ☐

SEE PROGRAM LISTING ON PAGE 81

MASS DUPLICATOR
Chip Level Designs
C-64 with MSD SD-2
Price: $25.95

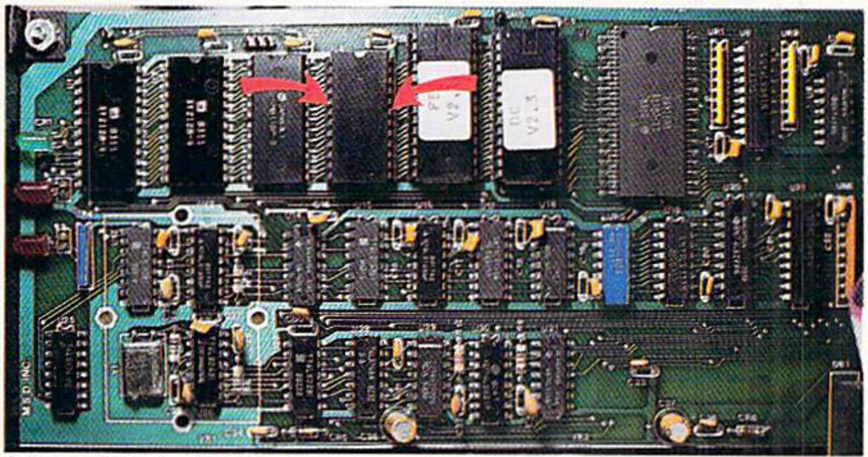
It has been over three years since we reported on the MSD SD-2 dual disk drive for the C-64. Since that time MSD has dropped out of the Commodore market entirely. During its brief distribution a fair number of SD-2s were sold. Most of them ended up in the hands of small developers, user groups and individuals with a need for duplicating large quantities, of 1541 format disks. A modest investment in MSD-2 disk drives gives you the ability to go into the business of mass producing C-64 software.

Interestingly enough, the MSD SD-2 has always received some measure of support from the Commodore community. In particular, *Fasthack'em* from Basement Boys Software has always included the SD-2 on its main menu. The reason for this support has recently come to our attention. All those thousands of copies of *Fasthack'em* sold by the Basement Boys were created on their own SD-2 disk drives.

Although Basement Boys Software seems to have closed up shop, their influence lingers on. The *Mass Duplicator* from Chip Level Designs has been brought to market by Lawrence Hiler, an ex-Basement Boy. It is actually based on a design used by the Basement Boys for their own work.

The *Mass Duplicator* consists of two parts, a 24 pin mystery chip and a software driver on disk. The chip is a mystery due to the fact that its identifying markings have been removed. We quickly ascertained that it was simply two kilobytes of static RAM. The chip is readily installed in an empty spot on the SD-2's main circuit board. The SD-2 was originally designed for 6K of RAM but was ultimately manufactured with only 4K. The circuit board was never changed from the original design and carries all the traces for the additional RAM. This additional 2K of RAM allows the SD-2 to copy an entire track in a single pass.

PHOTOS: MORTON KEVELSON

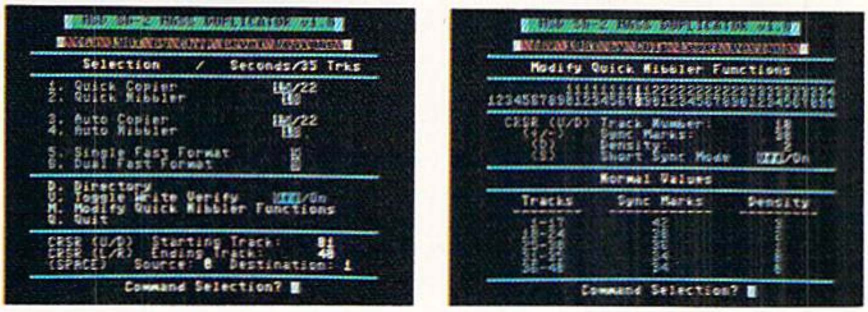


Mystery chip for the **Mass Duplicator** *installed in the SD-2, between the drive's ROM and RAM chips.* *READER SERVICE NO. 175*

The *Mass Duplicator's* manual suggests that the chip may be easily installed by simply inserting the provided socket and bending its leads into contact with the circuit board. This is apparently an attempt to avoid the need for soldering skills. We feel that this approach is just asking for trouble. The socket should be soldered to the main circuit board to obtain reliable operation. The circuit board is readily accessible once the SD-2's cover is removed. The installation should take no more than five minutes.

The extra RAM opens up the possibility for very high speed operation with the proper software, which is provided on the accompanying disk. The driving program boots in less than ten seconds. The last three seconds consists of a screen shimmer which is sure to shake you up the first time you see it. Interestingly enough, the driving software can not be copied. According to Lawrence Hiler, the high speed boot routine could only be achieved with a custom disk format. This sounds like a peculiar comment coming from an ex-Basement Boy. It seems to us that for an extra five seconds or so it should have been possible to make a disk which could be backed up.

The *Mass Duplicator* does all that it claims to do. All operations are selected from two full-screen menus.



All operations are chosen from **Mass Duplicator's** *main (left) and nibbler menus.*

There are no fewer than four high speed copiers. The basic copier will duplicate a disk in 15 seconds without verify and in 22 seconds with destination disk verify. This copier will also handle some disk errors, but it will grind to a halt on errors 20, 21, and 22. The quick nibbler will handle most other disks in just 18 seconds.

A second menu screen customizes the nibbler on a track by track basis. This lets you select density (0-3) and number of synchronizing marks (1-99),

and toggles the short sync mode. You are on your own when it comes to determining just what settings will be required for a given task. Other than a table of normal values, no other data is provided on how to implement these options.

The main menu also provides an auto copier and an auto nibbler. This lets the SD-2 duplicate disks without the use of the computer. All the operator has to do is swap disks when the job is done. The version of the *Mass Duplicator* we looked at required that both the source and destination disks be swapped to trigger the auto copiers. Mr. Hiler has indicated that this will be changed so that only the destination disk has to be swapped. This would make much more sense for generating multiple copies of a single disk.

Mass Duplicator also takes the wait out of disk formatting, as two disks with unique names and IDs may be simultaneously formatted in just nine seconds.

Chip Level Designs is now shipping a replacement ROM for the MSD SD-2. This adds fast copy (15 seconds) and fast copy with verify (22 seconds) commands to the drive's repertoire. As of this writing we are still waiting for our copy of this chip.

The *Mass Duplicator* is an effective low cost utility for the SD-2 disk drive. Our sample has already received considerable use since its arrival a short while ago. If you currently have regular use for the MSD SD-2, the *Mass Duplicator* should be considered.

Chip Level Designs, P.O. Box 603, Astoria, OR 97104-0603 (phone: 503-861-1622). *—Morton Kevelson*

THE MSD DUAL DRIVE CANNON
Computer Mart
C-64 and the MSD SD-2
Price: $34.95

When it rains it pours. More than three years since the introduction of the MSD SD-2 and after MSD has stopped producing it, we suddenly find several sources of third party support for the SD-2. The *MSD Dual Drive Cannon* is being produced and distributed by the same people who brought us the *Kracker Jax Protection Busters,* a series of disks full of parameters for copying protected software. The *Kracker Jax* disks presently consist of five volumes and are still going strong.

Although the *MSD Dual Drive Cannon* carries on Computer Mart's penchant for explosive titles, it falls into the category of a bona fide disk utility. This is in spite of the inclusion of 32 deprotection parameters on the distribution disk. Although the MSD SD-2 suffers from compatibility problems with protected software, it can be an excellent tool for duplicating many protection schemes. The irony of it all is that although the copied disks will run off a 1541 disk drive, they still cannot be loaded from the SD-2. The application of deprotection parameters will sometimes generate a copy which is usable on the SD-2. However, software whose very operation depends on the 1541 DOS routines will still not run.

The *MSD Dual Drive Cannon* makes a good companion utility for the *Mass Duplicator* (see above). Although it does duplicate some of the *Mass Duplicator's* functions, such as a whole disk copier, the *Cannon* includes many additional functions such as an easy to use file copy utility and a full featured track and sector editor.

The file copy utility is based on the SD-2's built-in DOS copy command. Unlike the DOS copy command, you do not have to supply the source file names. The *Cannon* reads the disk directory into memory and allows you to choose any number of files to be copied from an onscreen listing. The most significant limitation to this approach is the inability to automatically rename the destination files as part of the copy process.

There are a total of three types of whole disk copiers in both manual single shot and automatic versions. The latter are triggered by the swapping of the destination disk and will run without the benefit of the computer. The nibble copiers will attempt to reproduce all data including non-standard formats and errors. This will reproduce many early forms of copy protection. The standard copier does not reproduce disk errors. The resulting copy is error free. This may result in the loss of some data; however, the intent is to patch up the resulting copy using an additional utility such as the *Kracker Jax* parameters. There is also a copier which will stop when it encounters a disk error. This feature can be used to verify that your source data disks have not been corrupted. An alternate approach could have been to copy the entire disk while reporting all errors. All the whole disk copiers require about one minute to copy an entire disk.

The *Cannon* includes a full-featured track and sector editor. The screen display of this utility bears a strong resemblance to the public domain sector editor known as *Disk Doctor.* That is, all 256 bytes of a disk sector are displayed as a single block, using the PETSCII character set, on the top half of the screen. We still prefer the open arrangement of four byte groups used by the original *Clone Machine.* The lower half of the screen displays the character under the cursor in both hexadecimal and decimal. The data may be edited by entering either text, decimal, or hexadecimal characters.

The lower half of the screen also contains a menu of the available commands. This part of the screen may be

switched to a 10-line disassembly of the sector data, starting with the byte under the cursor. The disassembly is continuously updated as the cursor is scrolled through the data. All unrecognized values are displayed as the so-called unimplemented 6502 opcodes whenever possible. The continuous updating of the disassembly in this fashion makes it difficult to follow a line of code, as the results are dependent on the cursor position.

Overall the *MSD Dual Drive Cannon* provides an easy user interface for all disk maintenance on the MSD SD-2. The program appears to be written in *Blitz!*-compiled BASIC with some machine language modules. As a result, some operations are not as quick as they could be. The main menu also includes direct access to the disk drive's scratch, rename, and format commands. All of these require manual entry of the appropriate data.

Computer Mart, 2700 NE Andersen Road, Vancouver, WA 98661 (phone: 206-695-1393). ***Morton Kevelson***

THE MSD DOS REFERENCE GUIDE
Computer Mart
Price: $29.95

Last but not least we have a detailed dissertation on the workings of the MSD DOS. The major part (140 pages) of this 200 page book consists of a fully annotated disassembly of the 16 kilobytes of code in the MSD ROMs. This detailed listing is accompanied by a ten page ROM map of all the major DOS routines and a seven page listing of the MSD's 4 kilobytes of RAM. The remaining chapters include information on the 6511Q microprocessor, some details on the operation of the MSD DOS, a description of the hardware, and some sources of additional information on or related to the workings of the MSD disk drives.

The final chapter is a listing of various demonstration programs and utilities which incorporate direct calls to the DOS. These include the mandatory programs for creating the various DOS errors used by early forms of Commodore disk copy protection. Each program is listed in BASIC with machine language routines in DATA statements and a disassembly of the corresponding code.

The book includes a double sided disk with both sides chock full of additional data as well as the programs in the book. We also found a collection of MSD utilities, a 6511Q disassembler, program compatibility listings, MSD parts lists, and MSD user lists among other interesting items.

The *MSD DOS Reference Guide* is a valuable collection of data on the MSD disk drives which will be of interest to advanced users of the drive. The information was obviously compiled at the expense of considerable time and effort by an individual (David W. Martin) with a deep interest in the subject matter. This book is a must have for anyone interested in delving into the intricacies of the MSD disk drives.

Computer Mart, 2700 NE Andersen Road, Vancouver, WA 98661 (phone: 206-695-1393). ***—Morton Kevelson***

(Note: The *Mass Duplicator*, the *MSD Dual Drive Cannon* and *The MSD DOS Reference Guide* are available as a package from Computer Mart for $79.95.)

THE BOSS
SoftTools
Commodore 64
Disk; $35.00

This program is almost a dream come true for all the modem fanatics in our reading audience. You finally have an alternative to writing machine language subroutines to perform each useful input/output operation using the RS-232 modem port on your C-64.

Before *The Boss* was written, BASIC programmers were forced to write very cumbersome code, consisting primarily of POKE and PEEK statements which made little sense even to the programmer when looked at months later.

With this program any experienced BASIC programmer can take advantage of an expanded BASIC language, which now includes commands to facilitate sending data, receiving data, detecting phone ringing and carriers, as well as many other vital features.

If you really want to write any type of program that uses the modem, and if you must write it in BASIC, then you

should consider this package. You no longer have to worry if your new machine language routine is written correctly, or if it is reliable enough to use in your BBS program.

The package does have a few shortcomings, but as you will see, they are not of any serious consequence to those individuals who should be most interested in buying this program. The most annoying fact is that the program will not work with the C-1670 modem (or any 1200 baud modem); but we have been notified that the new version, which should be out by the time you read this, will feature an option for 300 and 1200 baud compatibility as well as upload and download routines.

Although the program does include a DIAL command, it has no option for touch-tone phones, and the slow speed of the pulse dialing is almost unbearable. Since this program will be used mainly by people who want to write BBS programs, which don't need to dial many outside numbers, this is only a minor annoyance.

The program comes with a spiral-bound, 58-page manual. Although the manual is well-written, and it does explain each command quite clearly, it still has a few mistakes, some of which contradict previous instructions. Just keep that in mind while you are writing code with this program, and be prepared for any problems that this might cause.

Although our version came with a progress report, describing what kind of bugs the manufacturers are aware of and what enhancements they expect to add in the next version, we found that the program sometimes had problems receiving data from the modem. But the included report did warn us about this, so we could take the necessary precautions. It was still an annoying bug, but we were assured that it would be fixed in the next version.

The Boss' command set is divided into five different groups. They are Set-Up, Modem I/O, Disk I/O, Conversion, and Miscellaneous commands.

The Set-Up commands allow you to define which modem you have and what channel you want to assign it to. They also allow you to set the drive and the device number of any drives being used. Setting the time or date can also be done in one command, and the program keeps track of each until you reset or turn off the machine.

The real heart of the program is held in the Modem I/O command set. These commands let you send data and receive data with the modem. You can also, using single commands, hang up or pick up the phone line, and detect the carrier or ringing. It is these commands alone that would justify the cost of the program.

The Disk I/O commands are very useful and, considering that they are not needed for modem programs, really are a bonus. The new commands let you read the directory into a string array, print the directory, and search for a specific name in the directory with the option of using real wildcards. The program also monitors the error channel and stores the status in DS, with the error name in DS$, similar to the C-128.

Conversion functions should save many programmers a lot of effort. The conversion routines allow data to be converted from ASCII to PETSCII or vice versa, and they also allow case changes in either direction.

The Miscellaneous commands offer a strange but wide variety of command types. Similar to the Apple command of the same name, the POP command will let the programmer remove the address of the last GOSUB performed (that is very useful when you must use nested GOSUBs). *The Boss* also has a built-in mini-terminal program which can be activated in just one command, even from a BASIC program.

In order to facilitate the construction of a BBS program, *The Boss* also includes a single command that will sort *any* string array in either ascending or descending order. Of course, no BASIC extension program would be complete without an INSTR function, which locates one string within another and returns the starting location of the target.

Considering the price, versatility, and quality of this program, it is a must-have for anyone who intends to do any serious modem programming. But I suggest that you wait until the aforementioned flaws are corrected before you make the investment.

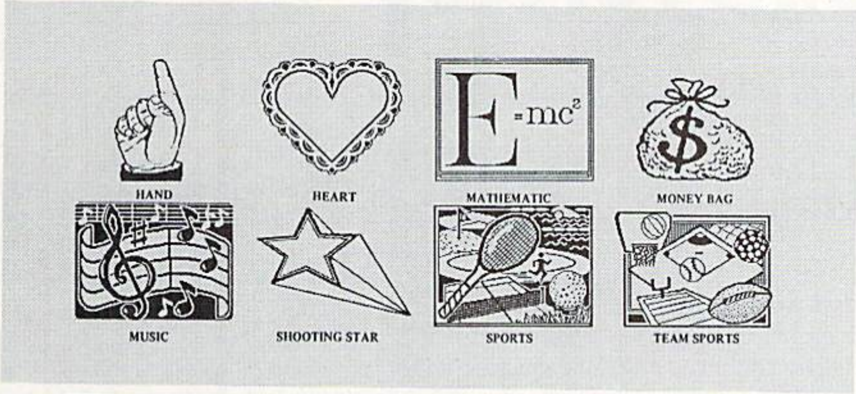
SoftTools, Snowdon P.O. Box 1205, Montreal, PQ H3X3Y3. *–Tim Little*

AWARDWARE
Hi Tech Expressions
Commodore 64/128
Disk; $14.95

There are few experiences more satisfying to computer owners than making something attractive to show off to their friends. It's especially gratifying when their efforts result in items that are practical as well as pretty.

AwardWare is the latest in the line of creativity programs from Hi Tech Expressions. Like the other products from this Florida company, *AwardWare* provides budget-conscious computerists with an extremely versatile tool for creating personalized printed materials. The computerist can also make an award disk to send to computer-owning friends, who can look at and print the citation even if they don't have a copy of the program itself.

Versatility and ease of use makes *AwardWare* a double value. Along with awards and certificates, templates are provided to create personalized licenses, bank cheques, memorandums, tic-



AwardWare ***offers more than 20 graphics for dressing up certificates, plus assorted borders and type styles.*** ***READER SERVICE NO. 221***

kets, coupons, signs, and letterhead stationery. A quartet of special designs create prize ribbons. There are even seals to decorate checks and trophies.

Creating a personalized award is a snap. The manual guides beginners step by step through a sample certificate, but it's such a straightforward process that most people could dope it out for themselves just by following the menus.

First the computerist selects the format of the award. There are 60 templates, both horizontal and vertical styles, and a couple of dozen more designs for special uses. After entering the number of the template, a work screen pictures the form. The computerist cursors from one area to another of the template to complete its parts.

There are 20 border designs, plus a special option that lets the creator make up text borders, or even combinations of text and art. There are a few standards for formal awards, but the majority of the borders are pretty, if not downright cute. Hearts, apples, crescent moons, sailboats, even dinosaurs are some of the devices that march obligingly around the frame for trendy awardmakers.

After selecting the border, the computerist chooses a graphic to adorn the creation. There are 20 designs or the award can be left plain. Pictures included are partying animals, apple, bear, book, butterfly, computer, dinosaur, doghouse, dollar, flag, goose, graduation, hand, heart, mathematic, money bag, music, shooting star, sports, and team sports.

Next the computerist chooses the font from five type styles: Block, Italic, Old English, Roman, and Script. These appear on the awards in small, medium, or large type, depending on the format of the template selected. Some templates have more than one text block; the computerist chooses the type style for each block individually, then writes the citation, verse, or message on the certificate.

After completion of the main body of the award, the computerist chooses the type of signature block. This may be a signature with the date and official title of the signor, signature and date on the left with decorative seal on the right, signature and date on the right with seal on the right, or signature and date centered at the bottom of the page. There are five seals: a bear, a sheep with "ewe's great" logo, a "you're the best" ribbon, a star, and a thumbs up with "terrific job" logo.

There's a lot packed into the *AwardWare* program. It contains a top-quality collection of templates for awards and certificates, and enough of the special designs to give the computerist a lot of ways to use the program. By varying the borders, type styles, and graphics, there is virtually no limit to the number of personalized citations that can be created.

AwardWare belies its budget price with high quality and ease of usability. It's a lot of fun to make up these special awards, for serious or trivial occasions, and it's great to tell a friend how high he ranks in your favor (or how he's bombed out!) with a personalized, low-cost greeting that couldn't be purchased in any store!

Hi Tech Expressions, 1700 NW 65th Avenue, Suite 9, Plantation, FL 33313 (phone; 305-358-5153). *—Joyce Worley*

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The publisher cannot assume responsibility for errors in the above listing.

FLOTSAM

Send letters to *Flotsam*, c/o *Ahoy!* Magazine, Ion International Inc., 45 West 34th Street—Suite 500, New York, NY 10001.

! WE HAVE A WINNER !

That was the winning message of Bob Blackmer's *Wizard Tag II*...and that's what we have this month in the person of Steve Spivey of Inverness, FL. As of this writing more than 25 readers have completed the ninth level of *Wizard Tag II* and written us with the message above to prove it.

We'd originally planned to name as winner the reader who finished with the best time. But because validation of times is not possible we decided that Steve, whose letter bore the earliest postmark, would receive the prize of a year's subscription to the *Ahoy! Disk Magazine* ($97 value) and the honor of play-testing Bob Blackmer's next programming effort. Sorry to those players who posted better times—but if we did this on the honor system, no one listed here would have won anyway. You wouldn't believe some of the outrageous "time remaining" claims we received (and disqualified). However, each of the runners-up listed will receive a free *Ahoy! Disk*.

Some comments from contestants:

"I find much more pleasure in writing programs than in playing them, but this one was an exception."—Robert Cook

"I can guarantee that my joystick will never be the same! It's a super game. My husband and two kids like it too."—Diane Upton

"I dare you to make a game I can't solve in one or two tries. Your graphics and animation are great, but there's just no challenge! I am looking forward to being challenged; don't disappoint me."—Wayne Metz

"I found *Wizard Tag II* to be the second best game I've played on a Commodore. *Vortex* from the January '87 *Ahoy!* is the leading Commodore game and *Lode Runner* on the Apple is the best game I've ever played—and the only good reason to own a sorry Apple."—Steve Spivey

"Guess what I did on my 13th birthday with one arm tied behind my back? I beat your game. The next one (had) better be harder if a person just turned 13 can beat it."—Jay Luce

"This game is much better than the first *Wizard Tag*. How about creating *Wizard Tag III* with an ever bigger maze?"—Bryan Kollar

"Should there be a sequel to *Wizard Tag II*, I'll be waiting at the keyboard."—Paul Browning

"If you're planning a sequel to *Wizard Tag II*, a bigger board might be more challenging. The floors with snakes could contain 2 or 3 snakes, and possibly more dangers, like a cat or dog. As for the Wizard, you could have him randomly set anywhere on the board."—Leonel Marchan

We'd be glad to hear from readers who surpass the times posted here—however, no more prizes will be awarded. Not for playing *Wizard Tag II*, that is. But we had so much fun with this contest that we'll be sure to hold another one soon.

Player	Date of Postmark	Time Remaining
Steve Spivey (Inverness, FL)	5/28	1:47
Victor Lams (Ann Arbor, MI)	5/29	0:45
Wayne Metz (Kansas City, MO)	5/30	1:49
Cindy Kamora (Lake Ariel, PA)	5/30	0:45
Rajesh Michael (Bedford, TX)	6/1	7:23
Craig Russell (Beaumont, TX)	6/2	1:49
Roger West (Houston, TX)	6/3	1:59
Michael Goodrich (Houston, TX)	6/3	0:31
C.J. Jones (Yulee, FL)	6/4	1:16
Richard Temps (San Diego, CA)	6/6	1:17
Eric L. Stout (Topeka, IL)	6/7	2:53
Bryan Kollar (Nanticoke, PA)	6/8	2:06
Gary L. Grable (Mason, MI)	6/8	0:58
Diane L. Upton (No. Adams, MA)	6/8	0:41
Paul Browning (Clarksville, TN)	6/9	0:53
Leonel Marchan (Waukesha, WI)	6/10	0:44
Douglas Blodgett (Portland, ME)	6/11	2:31
Mark Finn (Eureka, MO)	6/11	2:06
Beth Ann Jones (Milton, VA)	6/11	0:39
J. Sergio (Bristol, CT)	6/14	0:37
Chris Burrus (Lexington, KY)	6/15	?
John Puffpaff (Jacksonville, NC)	6/16	1:02
Jay Luce (Marble Falls, TX)	6/16	0:43
David Ray (Wesson, MS)	6/18	3:48
Tim Reddy (Catlin, IL)	6/18	0:04
M. Stamps (Louisville, KY)	6/22	3:24
Teresa Hawkey (Lawrence, KS)	6/22	3:44
Robert Cook (Braintree, MA)	6/22	2:48
Mark Johnson (Davenport, IA)	6/23	2:24
Shawn Miller (Kekaha, HI)	6/23	0:21

ERRATA

UNIVADERS (July '87)

The documentation for *Univaders* omitted the instructions for actually starting the game. Once you have entered and run the program, you should have a new file on the disk called UNIVADERS. Turn off or reset your machine and type

```
LOAD "UNIVADERS",8,1 [RETURN]
```

After the READY prompt appears on the screen, type SYS 49152 [RETURN] and the game will start.

PLINK & PLONK (July '87)

A few readers were confused by the extra spaces that appeared in the middle of lines 4000 and 4010 of *Plink & Plonk*. As the majority of you guessed, they don't belong there. Simply move the last segment of each line up and continue typing.

ZING! Review (July '87)

No author was listed for the review of *Zing!* in July's *Amiga Section*. It was Morton Kevelson.

CHAINMAIL!

For the C-128

By Cleveland M. Blakemore

CRASH!
...SWISH!
...UUMMPPHH!
...AARRGGH!

The Crimson Knight staggers you with a blow that knocks you nearly senseless, then batters you toward the edge of the pit. You cartwheel helplessly, almost losing your balance, then regain your equilibrium just in time to leap forward beneath another well-timed swing that would've plunged you to your death. Your green armor is dented in several places where you've been struck before, and you are weak from injury.

If you can only make it to the mystic flame! You dodge around the opposite side of the pit, avoiding the thrusts of your opponent, finally reaching the flickering sacred fire in the corner of the dungeon, and you plunge your enchanted sword into its heart.

In seconds your body is flooded with newfound strength, nourished by the magic blaze, and you turn in the firelight to face your enemy, who squares off for another round of blows....

You must be playing *Chainmail!*

This is a two-player game for the C-128, written in a hybrid program of machine language and BASIC Seven-point-oh.

The graphics are excellent, but the complexity of the game may seem deceivingly simple at first. *Chainmail!* is a game of strategy and dexterity, with infinite variations.

The game takes a moment at the beginning while it loads the ML data, POKEs the sprite shapes, and draws the dungeon. Then an original little tune I composed for the game begins playing in three part harmony until both players press their joystick buttons.

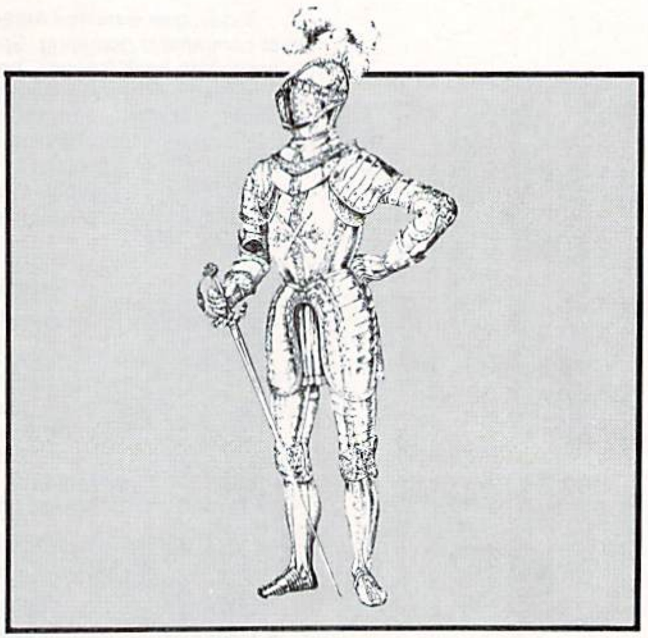
The graphics represent a view of a dungeon deep in the earth, as seem from above. The two player's figures are knights, as seen looking down into the room.

The Crimson Knight is player one, and the Green Knight is player two. Each player has a complementing "strength" bar offscreen.

There are two ways to be killed in *Chainmail!*

The first is to let your strength bar drop below zero. The second way to is fall (or be pushed) into either of the two three-dimensional vertical shafts in the room. When a player is killed, a skull and crossbones will appear in his location. The contest of knights is over, and you will be returned to the main title screen.

To rotate your onscreen alter ego, simply move the corresponding joystick left to rotate clockwise, right to rotate counterclockwise.



To move him around the screen, depress the fire button and push the knight in the direction you want to move, limited only by the walls of the dungeon. The motion is very smooth and quick, because it is serviced by an interrupt routine.

To swing your sword, depress the joystick button by itself. You'll hear a swish, and your sword will flick out directly in front of you.

This is strictly a duel of noble knights. Hitting your opponent from behind is not permitted. You must be facing your opponent to strike him with the sword. To injure him, you must catch him off guard with his sword in the raised position. To block an opponent's blow, your sword must be out.

After a few good hits from your enemy, you may find yourself getting pretty weak. Have no fear! Merely touching one of the sacred fires in either corner of the room will restore you to full strength in a matter of seconds. Only one knight at a time can refresh his strength, however. If both knights try to touch the healing fire at the same time, they will be pushed back.

A much quicker way to kill the other knight is to shove him into one of the pits, where his armored figure will whistle down to the bottom and land in a crumpled heap, dead.

Whenever one knight shoves another, he is pushed in the direction his opponent is pointing. For instance, to push you opponent into the shaft on the left, rotate until you are pointing in that direction, then situate yourself behind his left shoulder and begin shoving. Unless he maneuvers out of the way in time, he will topple into the shaft with a

Continued on page 97

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SPRITESHELL 128

Continued from page 50

GRAPHIC0, the text screen. Merely setting aside memory for the GRAPHICS area will not direct the commands to the screen.

The demo program SHELL DEMO loads in the interrupt object code and a small sprite file in order to demonstrate the proper method to initialize the interrupt. Two players wander around inside a cave filled with flapping bats. Both the bats and the players cannot move beyond the borders until you change them. You can imagine how easy it would be to add a few dollar signs to the cave, and a collision check between the bats and players—and you would have a simple game where two players could race against the clock to gather gold inside the cave.

You should be able to come up with a nearly limitless supply of ideas for games now that you have the means to control sprites efficiently. Since the interrupt saves a lot of time that would normally be wasted in added BASIC processing, your main loop will basically only need to change sprite directions and check for collisions, keep track of score, or monitor game logic. If you are creative and resourceful, your C-128 should now begin producing that harvest of arcade-quality games promised in Commodore's sales literature, with the convenience of programming in simple, easily debugged Commodore BASIC.

A few mind-stimulators to get you started...

"Space Invaders" with sprites moving in preset patterns back and forth while you fire at them using sprite two as a missile.

Two-player tank games where you move around inside a compound firing missiles at one another. The missiles could be shimmering fireballs!

Adventure games where you slide around inside a castle avoiding flailing creatures and collecting treasures, all the while flinging daggers at your enemies.

This program comprises three files: *Spriteshell 128*, DEMO.SPRITES, and SHELL DEMO.

The program SHELL DEMO is a BASIC listing you can enter in 128 mode, but the other two files are in machine language. They will have to be entered in 64 mode.

Spriteshell 128 is the object code for the actual machine language interrupt. After you've goofed around with the demo, you will be able to use this file independently in your own programs by BLOADing it in at the beginning of your BASIC listing. Make sure you understand how it works before doing this. Study the simple demo to get a feel for it.

DEMO.SPRITES is merely a small file of three sprite shapes that are used by the demonstration program.

Flankspeed (see page 79) is used to enter two programs in 64 mode. Type "POKE44,64:POKE16384,0:NEW" before loading in *Flankspeed* in order to set BASIC memory above the area where you will be entering the two *Flankspeed* listings. Save at least two copies of each when you are finished, then go back to 128 mode to BLOAD these object files back into memory. Remember, you will only use *Flankspeed* to enter the 128 object code! *Spriteshell 128* will crash in 64 mode if you SYS to the starting location of the interrupt. The game utility is only intended for use with sprites on the C-128's operating system. □

SEE PROGRAM LISTINGS ON PAGE 80

COMMODARES
PROGRAMMING CHALLENGES
By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

Commodares, c/o *Ahoy!*
P.O. Box 723
Bethel, CT 06801

We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Put *your* name and address on the listings as well. Show sample runs if possible. Briefly describe your solutions and tell what makes them unique or interesting, if they are. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares!*

PROBLEM #45-1: IDEAL INPUT

This problem was suggested by Bret Ekstrand (Signal Hill, CA). Write a subroutine which allows the user to input commas, quotation marks, and colons as well as text without the "Extra Ignored" error or any other problems. Bret mentioned that you can stuff a quotation mark into the keyboard buffer, but unfortunately it would be displayed on the screen and that is undesirable. It may also mess up actual quotation marks entered by the user.

Your subroutine should take exactly what the user types and store it in the variable U$. Oh yeah, the INST/DEL key must work properly, too. Let's see solutions for the C-64 and for the C-128.

PROBLEM #45-2: FADE AWAY

John Yergaw (London, ONT) sent a long list of programs he would like to see. I'm afraid that "a rotating earth with continents on it spinning in a circle" is somewhat out of *Commodares'* league. But here's an interesting one you should enjoy. Make a word fade away. That's it. Display a word on the screen then make it fade away. How? That part is up to you.

PROBLEM #45-3: SUPER BOWL

Oren Dalton (El Paso, TX) suggested this challenge. Write a program to calculate the minimum and maximum bowling scores that can result from exactly five strikes and five spares. To simplify things, assume the player knocked down only five pins after the tenth frame. Show all solutions. Oren's program shows the ten frames in this form: X X X / / / / / X X where X represents a strike, and / represents a spare.

PROBLEM #45-4: FAST FACTORIAL

Use an assembler/monitor for the C-64 or the C-128 monitor to solve this one from Thomson Fung (San Diego, CA). Write assembly code to compute 5! (5 factorial) exactly, leaving the result in the X Register. Thomson's solution is 36 bytes long. Commented listings are essential if your solution is to be considered. By the way, 5! is 5 * 4 * 3 * 2 * 1. Your routine should perform the integer multiplications.

Before we begin our discussion of solutions to *Commodares* from the May issue of *Ahoy!*, here are two short sort routines send by Scott Duncan (Superior, NE) for the C-128:

```
1 REM ====================================
2 REM    COMMODARES PROBLEM #40-2 :
3 REM    SHORT SORT
4 REM    SOLUTION BY
5 REM    SCOTT DUNCAN
6 REM ====================================
10 N=8 :REM # OF ITEMS TO SORT
20 REM SELECT RANDOM NUMBERS TO BE SORTE
D
30 FOR I=1 TO N : J(I)=INT(RND(1)*1000-3
00):S(I)=J(I):PRINT J(I);:NEXT:PRINT
40 REM -- INSERTION SORT --
50 FOR I=2 TO N:T=J(I):K=I:DO WHILE J(K-
1)>T:J(K)=J(K-1):K=K-1:LOOP UNTIL K=1:J(
K)=T:NEXT
60 FOR I2=1 TO N:PRINT J(I2);:NEXT:PRINT
"INSERTION SORT"
70 REM -- SHELLSORT --
80 REM (REPLACE 1 AND 2 IN INSERTION SOR
T WITH H AND H+1)
90 H=2^INT(LOG(N)/LOG(2))-1:DO:FORI=H+1T
ON:T=S(I):K=I:DO WHILE S(K-H)>T:S(K)=S(K
-H):K=K-H:LOOP UNTIL K<=H:S(K)=T:NEXT:H=
INT(H/2):LOOP UNTIL H=0
100 FOR I2=1 TO N:PRINT S(I2);:NEXT:PRIN
T"SHELLSORT"
```

Scott clearly took advantage of the sophisticated loop con-

trol structures available in BASIC 7.0. In particular, the use of different conditional tests for the WHILE and the UNTIL statements is a very powerful feature.

Scott adapted sort routines described in *Algorithms* by Robert Sedgewick (Addison-Wesley, 1983). That book explains the workings of these sort routines and many others. You might enjoy comparing the times of these two routines. You specify the number of items to be sorted with the value of N in line 10. For values of N greater than 10, you must add a dimension statement such as

```
15 DIM J(N),S(N)
```

Now on to *Problem #41-1: Real Thing* submitted by J.H. Smalley (Boulder, CO). The problem was to write a short program to display the *exact* value of 2 ↑ 127 − 1, which is the largest floating point number the Commodore computers can use.

I must learn to be more careful in my wording of the problems. A few readers sent this one-liner which does fulfill the requirement, if not the intent, of the problem:

```
1 PRINT "170,141,183,460,469,231,731,687
,303,715,884,105,727"
```

Admittedly there was no mention of the number base in which the result was to be printed, so this solution suggested by Daniel Souza (N. Dartmouth, MA) also fills the bill:

```
10 FOR X=1 TO 127 : A$=A$+"1" : NEXT
20 PRINT "IN BASE 2, 2^127-1 IS ";A$
```

Yes, in the binary number system, the answer is a string of 127 1's.

But now on to the intended solutions. The shortest solution came from Clifford Dedmore Jr. (Coos Bay, OR).

```
1 REM ====================================
2 REM     COMMODARES PROBLEM #41-1 :
3 REM            REAL THING
4 REM     SOLUTION BY
5 REM            CLIFFORD DEDMORE JR.
6 REM ====================================
10 N(1)=1:FOR K=1TO127:FORJ=1TO5:N(J)=N(
J)*2+C%:C%=N(J)/1E8:N(J)=N(J)-C%*1E8
20 NEXTJ,K:N(1)=N(1)-1:FORK=1TO5:N$=STR$
(N(6-K)):PRINTMID$(N$,2,LEN(N$)-1);:NEXT
```

His program stores the result in five 8-digit elements of the N( ) array. Each element is repeatedly multiplied by two, 127 times. Each element can become as large as 1E8. The Commodore performs exact mathematical operations on numbers as large as 1E8. When an element becomes larger than that, it is reduced by multiples of 1E8, and the excess is carried in C% to the next larger array element.

To watch this program operate, you may modify line 20 to print intermediate results. Replace the NEXTJ,K statement with these statements:

```
NEXT J : FOR L=5 TO 1 STEP -1 : PRINT
N(L); : NEXT L : PRINT : NEXT K
```

Commodore 64 users must break line 20 into two lines with this modification.

You can use this program to calculate other powers of two. Change the 127 in line 10 to the desired power. For larger results, you may need to use more elements of the N( ) array. Change the 5's as necessary. Remember that N(1)=N(1)−1 in line 20 subtracts one from the result before printing the answer. Remove it if desired. For powers of numbers other than two, change the 2 in line 10.

Problem #41-2: New Name from Lon Olson (Mesa, AZ) was a good exercise in string permutations. The computer is to generate all possible 5-letter names for a new company according to these rules:

1) The first letter is the initial of your first name.
2) The fifth letter is the initial of your last name.
3) Of the three middle letters, at least one is a vowel (a, e, i, o, or u).
4) All five letters must be different (except the first and fifth may be the same).

This program from Jim Speers (Niles, MI) is the most compact of the solutions meeting all the requirements above:

```
1 REM ====================================
2 REM     COMMODARES PROBLEM #41-2 :
3 REM          NEW NAME
4 REM     SOLUTION BY
5 REM          JIM SPEERS
6 REM ====================================
200 X$="AEIOUBCDFGHKLMNPQRTVWXYZ":F$="J"
:L$="S":NV=5:NL=24
210 FORV=1TONV:FORA=1TONL-1:IFA=VTHEN260
220 FORB=A+1TONL:IFB=VTHEN250
230 A$=MID$(X$,A,1):B$=MID$(X$,B,1):V$=M
ID$(X$,V,1)
240 PRINT F$V$A$B$L$" "F$V$B$A$L$" "F$A$
B$V$L$" "F$A$V$B$L$" "F$B$V$A$L$" "F$B$A
$V$L$:N=N+6
250 NEXTB
260 NEXTA
270 NEXTV
280 PRINTN;"NAMES PRINTED"
```

You should change the value of X$, F$, and L$ as appropriate for your initials. Jim and several others also sent routines which allow the user to enter his initials. You may enjoy modifying this program to do that.

Among the more interesting names mentioned by readers were NMALS or NPETS (pet store), NRIBS (barbeque restaurant), and NEWTS (lizard farm) from Neil Spokes (Briarcliff Manor, NY); Mario Segal (Mexico City, Mexico) came up with MEATS for a steakhouse and MALES for a men's club; Jim Speers can be himself (JAMES), someone else (JONES), or "just another fat man" (JOWLS); Jim is also considering JADES, JEANS, or JOKES for his next business. Mike Suetkamp (Marion, IN) will open up a classy place; he will call it MIKES.

Necah Buyukdura (Ankara, Turkey) sent a good solution as well as some statistics. He said that the number of New

Names that can be generated is:

4554 when the first and last initials are two different vowels;

6072 when only one initial is a vowel;

6624 when both initials are the same vowel;

7590 when the two initials are different consonants;

8280 when both initials are the same consonant.

You statisticians may enjoy verifying these numbers.

Problem #41-3: Word Slider is an enjoyable animation challenge from Scott McClare (Espanola, ONT). The idea is to slide two words through each other on one line of the screen, one coming from the right and the other from the left. The word from the right has priority and is visible when the two overlap.

Among the short but sophisticated solutions is this one from Bob Renaud (Pittsfield, MA).

```
1 REM ===================================
2 REM     COMMODARES PROBLEM #41-3 :
3 REM         WORD SLIDER
4 REM     SOLUTION BY
5 REM         BOB RENAUD
6 REM ======  FOR C-128 ONLY  ==========
10 AT=65520:WINDOW0,12,39,13:DO:FORJ=0TO
34:SYSAT,,0,J:PRINT"STRING":SYSAT,,0,34-
J:PRINT"SLIDER":SLEEP1:PRINT:NEXT:LOOP
```

It is for the C-128 only. According to Bob, the program uses the JPLOT Kernal routine. It uses the WINDOW function to center the printout and avoids leftover letters by scrolling the previous line out of the window. The DO loop runs continuously until you press RUN STOP.

To restore the screen to full size, press the HOME key twice. ReLIST the program before making changes to it, since the line links for text on the screen were lost when the new window was created. You may adjust the speed of motion with the value in the SLEEP statement, or replace SLEEP with a FOR/NEXT loop for finer control. (SLEEP doesn't handle fractions of a second properly.)

A more straightforward approach is shown in the following program submitted independently by Robert Marcus (Agincourt, ONT), J.V. Henry (North Fork, CA), and by Casey Gorsuch (Wilson Creek, WA).

```
1 REM ===================================
2 REM     COMMODARES PROBLEM #41-3 :
3 REM         WORD SLIDER
4 REM     SOLUTION BY
5 REM         CASEY GORSUCH
6 REM         ROBERT MARCUS
7 REM         J.V. HENRY
8 REM ===================================
10 FORI=0TO37:PRINT"+"TAB(I)"CATS"TAB(37
-I)"DOG":FORX=0TO40:NEXT:NEXT
```

Change the value 40 to adjust the speed at which the words move.

Many readers successfully handled the difficulties of using two words of different lengths. Instead of using TABs to position the words each time, some readers repeatedly constructed mostly-blank strings 40 characters long with the positions of the moving words within the strings continuously updated. Other readers simply POKEd the word characters directly to the correct screen locations.

Still others positioned the cursor with POKEs before printing each word. On the C-64, these statements move the cursor to horizontal position X on screen line Y then print A$:

```
POKE 214,Y : PRINT : POKE 211,X : PRINT
A$
```

On the C-128, the statement CHAR,X,Y,A$ does the same thing. Thanks to Judy Groth (Brooklyn, NY), Edward Shaw (Lexington, KY), Danny Potts (Birmingham, AL), and Skot Hannon for describing the POKEs for the C-64.

The following solution from Dominique Vachon shows how the problem can be solved in Pascal.

```
1 REM ===================================
2 REM     COMMODARES PROBLEM #41-3 :
3 REM         WORD SLIDER
4 REM     PASCAL SOLUTION BY
5 REM         DOMINIQUE VACHON
6 REM ===================================
10 :PROGRAM WORD-SLIDER (OUTPUT);
11 : CONST FIRST = "DOG";
12 :        SECOND = "CAT";
```

```
13 : VAR A,D : INTEGER:
14 : BEGIN
15 :   FOR D := 0 TO 37 DO
16 :     BEGIN
17 :       CLEARSCREEN;
18 :       POSCURSOR(0,D);WRITELN (SECOND);
19 :       POSCURSOR(0,37-D);WRITELN(FIRST)
;
20 :       FOR A := 1 TO 20 DO
21 :         BEGIN END;
22 :     END;
23 : END.
```

The line numbers and leading colons are not needed. The POSCURSOR command is similar to the CHAR command described above.

The toughest challenge this month was *Problem #41-4: Smith Numbers* by Sol Katz (Lakewood, CO). A Smith number is an integer with the sum of its digits equal to the sum of the digits of its prime factors (whew!). The problem was to find and print Smith numbers.

To solve the problem, you must find the prime factors of a number, the sum of the digits of the number, and the sum of the digits of the prime factors. Each positive integer has a unique set of prime number factors. Multiplying the factors together gives the number.

This solution from Barry Warren (Coboconk, ONT) efficiently solves the problem.

```
1 REM =================================
2 REM     COMMODARES PROBLEM #41-4 :
3 REM        SMITH NUMBERS
4 REM     SOLUTION BY
5 REM        BARRY WARREN
6 REM =================================
10 DIM X(29):Z=4
20 P=Z:I=1:Y=1:PRINT Z,
30 Y=Y+1:IF Y*Y>P THEN X(I)=P:GOTO 60
40 Q=P/Y:IF INT(Q)<Q GOTO 30
50 P=Q:X(I)=Y:I=I+1:Y=Y-1:GOTO 30
60 ON I GOTO 110:S=0:FOR J=1 TO I:X=X(J)
:PRINT X;:GOSUB 90:NEXT:SX=S
70 S=0:X=Z:GOSUB 90:IF S=SX THEN PRINT :
 PRINT Z "IS A SMITH NUMBER";
80 Z=Z+1:PRINT:GOTO 20
90 Y=INT(X/10):S=S+INT((X/10-Y+.05)*10):
X=Y:IF X>0 GOTO 90
100 RETURN
110 Z=Z+1:PRINT "PRIME":GOTO 20
```

Z stores the number to be tested. The prime factors of Z are stored in the X( ) array. Lines 30 through 50 calculate the prime factors of Z. Line 40 repeatedly divides P (initially set to Z) by every integer divisor Y. If Y does not divide evenly into P, the program branches back to line 30 for the next divisor.

Once an exact divisor is found, P is replaced by the quotient, and the divisor (which is a prime factor) is stored in X( ) in line 50. The Y=Y−1 statement causes each Y value to be reused as many times as possible.

After the value of P is less than the square of the next divisor, all prime factors of Z have been found, and line 30 branches to line 60. The variable I keeps track of the number of factors found. If I is still 1 in line 60, then the number Z must be prime, and the program branches to line 110 to print that fact. If I is greater than 1, then line 60 prints each prime factor. I added the PRINT statements to Barry's program in lines 60 and 110 to show intermediate results.

Lines 60 and 70 call the subroutine at line 90 to add up the digits of the prime factors and of the original number in SX and S respectively. If the two digit sums are equal, the final statement in line 70 prints the Smith numbers. Line 80 increments the test number Z, and the process is repeated.

You may set Z to whatever starting value you desire in line 10. To look for Smith numbers larger than one million, simply use Z=1000000 in line 10, or press RUN STOP to stop the program and enter

```
Z=1E6 : GOTO 20
```

Congratulations to Necah Buyukdura (Ankara, Turkey), Bret Ekstrand (Signal Hill, CA), Gary Bond (Topeka, KS), and Jim Speers (Niles, MI) for good solutions to this masters-level challenge. Leo Brenneman (Erie, PA) disqualified himself from this problem since he personally knew Smith. Leo wondered how I got Smith's unlisted phone number. (Sorry, but I am not allowed to divulge that information.) By the way, I wonder what the largest Smith number and prime number are that this program is capable of finding. Anyone know?

Keep those suggestions and solutions coming. If you find the problems too easy, send harder ones. If these problems are always over your head, send easy ones. We aim to please (or at least to entice) everyone. See you next month.

Congratulations to the following people not already mentioned this month for sending valid *Commodares* solutions. Please be sure to include your address with your listing. The envelopes (and some return addresses) are discarded. □

Carmen Artino (Guilderland, NY)
Ernest Barkman (Orlando, FL)
Steven Blucher (Baltimore, MD)
Billy Brown Jr.
Dave Budgett (Graceville, MN)
Michael Cole
Curt Donofrio (Shelton, CT)
B. Donovan (Quebec City, QUE)
Craig Ewert (Crystal Lake, IL)
Jim Fidelholtz (Puebla, MEX)
R.E. Frazier (San Diego, CA)
Thomson Fung (San Diego, CA)
Ron Gow (Sacramento, CA)
Robert Groysman
Alan Gutierrez
David Hoffner (Brooklyn, NY)
Shaun Jones (Thackerville, OK)
Anibal Lopez (Rio Piedras, PR)
Jeff McCreary
Edward Nichols (Lawton, OK)
Dave Nowka
Lon Olson (Mesa, AZ)
Edward Shaw (Lexington, KY)
David Shiloh (Eugene, OR)
J.H. Smalley (Boulder, CO)
Mark Stevens
John Yarbrough (Glen Rock, PA)
Perry Yates (Galveston, TX)

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listings guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!'s* program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart. The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; C-128 lines, a maximum of 160 characters, 2 or 4 screen lines in 40 or 80 columns respectively). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the C-128 and C-64. The version for your machine will help you proofread programs after typing them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See instructions preceding each program.)

On the second page following you will find *Flankspeed*, our ML entry program, and instructions on its use.

Call *Ahoy!* at 212-239-6089 with any problems (if busy or no answer after three rings, call 212-239-0855).

WHEN YOU SEE	IT MEANS	YOU TYPE	YOU WILL SEE	WHEN YOU SEE	IT MEANS	YOU TYPE	YOU WILL SEE
[CLEAR]	Screen Clear	SHIFT CLR/HOME		[BLACK]	Black	CNTRL 1	
[HOME]	Home	CLR/HOME		[WHITE]	White	CNTRL 2	
[UP]	Cursor Up	SHIFT ↑ CRSR ↓		[RED]	Red	CNTRL 3	
[DOWN]	Cursor Down	↑ CRSR ↓		[CYAN]	Cyan	CNTRL 4	
[LEFT]	Cursor Left	SHIFT ← CRSR →		[PURPLE]	Purple	CNTRL 5	
[RIGHT]	Cursor Right	← CRSR →		[GREEN]	Green	CNTRL 6	
[SS]	Shifted Space	SHIFT Space		[BLUE]	Blue	CNTRL 7	
[INSERT]	Insert	SHIFT INST/DEL		[YELLOW]	Yellow	CNTRL 8	
[DEL]	Delete	INST/DEL		[F1]	Function 1	F1	
[RVSON]	Reverse On	CNTRL 9		[F2]	Function 2	SHIFT F1	
[RVSOFF]	Reverse Off	CNTRL 0		[F3]	Function 3	F3	
[UPARROW]	Up Arrow	↑	↑	[F4]	Function 4	SHIFT F3	
[BACKARROW]	Back Arrow	←	←	[F5]	Function 5	F5	
[PI]	PI	π	π	[F6]	Function 6	SHIFT F5	
[EP]	English Pound	£	£	[F7]	Function 7	F7	
				[F8]	Function 8	SHIFT F7	

BUG REPELLENT FOR THE 64 & 128 By BUCK CHILDRESS

Please note: the *Bug Repellent* programs listed here are for *Ahoy!* programs published from the May 1987 issue onward! For older programs, use the older version.

Type in, save, and run *Bug Repellent.* You'll be asked if you want automatic saves to take place. If so, you're prompted for the device, DISK (D) or TAPE (T). You then pick a starting file number, 0 through 99. Next, you enter a name, up to 14 characters long. At this point, *Bug Repellent* verifies your entries and gives you a chance to change them if you want. If no changes are needed, *Bug Repellent* activates itself. (Pressing RETURN without answering the prompts defaults to disk drive and begins your files with "00BACKUP".)

Type NEW and begin entering an *Ahoy!* program. As you enter program lines and press RETURN, a *Bug Repellent* code appears at the top of your screen. If it doesn't match the code in the program listing, an error exists. Correct the line and the codes will match.

If used, automatic saves take place every 15 minutes. When the RETURN key is pressed on a program line, the screen changes color to let you know that a save will begin in about three seconds. You may cancel the save by pressing the RUN STOP key. The file number increments after each save. It resets to 00 if 99 is surpassed. After saving, or cancelling, the screen returns to its original color and the timer resets for 15 minutes.

When you've finished using *Bug Repellent*, deactivate it by typing SYS 49152 [RETURN] for the Commodore 64 or SYS 4864 [RETURN] for the Commodore 128.

C-64 BUG REPELLENT

```
•10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3"."]":J
 =49152
•20 FORB=0TO11:READA:IFA<0ORA>255THEN40
•30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
•40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(64)*256+PEEK(63)
 :END
•50 X=0:J=J+12:IFJ<49456THEN20
•60 POKE198,0:POKE49456,0:A$="Y":B$=A$:C$="D":D$="DISK":D
 =8:PRINTCHR$(147)
•70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)";A$:PRINT:IFA
 $="Y"THEN90
•80 PRINT"NO AUTOMATIC SAVES[3"."]":GOTO150
•90 POKE49456,1:INPUT"DISK OR TAPE (D/T)";C$:IFC$<>"D"THE
 ND=1:D$="TAPE"
•100 POKE49457,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (
 0-99)";N
•110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
 )
•120 F$="BACKUP":PRINT:INPUT"FILENAME";F$:F$=N$+LEFT$(F$,
 14):L=LEN(F$)
•130 POKE49458,L:FORJ=1TOL:POKE49458+J,ASC(MID$(F$,J,1)):
 NEXTJ:PRINT
•140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
 $
•150 PRINT:INPUT"IS THIS CORRECT (Y/N)";B$:IFB$<>"Y"THEN6
 0
•160 POKE770,131:POKE771,164:SYS49152:END
•170 DATA169,79,32,210,255,162,38,160,192,204,3,3,1507
•180 DATA208,10,162,131,160,164,169,70,32,210,255,44,1615
•190 DATA169,78,32,210,255,142,2,3,140,3,3,76,1113
•200 DATA36,193,32,96,165,134,122,132,123,32,115,0,1180
•210 DATA170,240,243,162,255,134,58,144,3,76,150,164,1799
•220 DATA32,107,169,32,121,165,173,0,2,240,5,169,1215
•230 DATA79,141,2,3,76,162,164,169,0,133,2,133,1064
•240 DATA251,133,252,133,254,24,101,20,69,254,230,254,197
 5
•250 DATA24,101,21,69,254,170,230,254,164,252,185,0,1724
•260 DATA2,133,253,201,34,208,6,165,2,73,255,133,1465
•270 DATA2,201,32,208,4,165,2,240,8,138,24,101,1125
•280 DATA253,69,254,170,44,198,254,230,252,164,253,208,23
 49
•290 DATA213,138,41,240,74,74,74,74,24,105,129,141,1327
•300 DATA44,193,138,41,15,24,105,129,141,45,193,162,1230
•310 DATA0,189,43,193,240,12,157,0,4,173,134,2,1147
•320 DATA157,0,216,232,208,239,169,38,141,2,3,173,1578
•330 DATA48,193,240,23,165,161,201,212,176,4,165,160,1748
•340 DATA240,13,238,32,208,160,0,32,225,255,208,6,1617
•350 DATA32,33,193,76,38,192,232,208,242,200,208,239,1893
•360 DATA32,68,229,169,0,168,174,49,193,32,186,255,1555
•370 DATA173,50,193,162,51,160,193,32,189,255,169,43,1670
•380 DATA166,45,164,46,32,216,255,162,1,189,51,193,1520
•390 DATA168,200,152,201,58,144,2,169,48,157,51,193,1543
•400 DATA201,48,208,3,202,16,234,32,33,193,76,116,1362
•410 DATA164,206,32,208,169,0,170,168,76,219,255,160,1827
•420 DATA1,1,160,0,0,65,72,79,89,33,0,0,500
```

C-128 BUG REPELLENT

```
•10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3"."]":J
 =4864
•20 FORB=0TO11:READA:IFA<0ORA>255THEN40
•30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
•40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(66)*256+PEEK(65)
 :END
•50 X=0:J=J+12:IFJ<5213THEN20
•60 POKE208,0:POKE5213,0:A$="Y":B$=A$:C$="D":D$="DISK":D=
 8:PRINTCHR$(147)
•70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)";A$:PRINT:IFA
 $="Y"THEN90
•80 PRINT"NO AUTOMATIC SAVES[3"."]":GOTO150
•90 POKE5213,1:INPUT"DISK OR TAPE (D/T)";C$:IFC$<>"D"THEN
 D=1:D$="TAPE"
•100 POKE5214,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (0
 -99)";N
•110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
 )
•120 F$="BACKUP":PRINT:INPUT"FILENAME";F$:F$=N$+LEFT$(F$,
 14):L=LEN(F$)
•130 POKE5215,L:FORJ=1TOL:POKE5215+J,ASC(MID$(F$,J,1)):NE
 XTJ:PRINT
•140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
 $
•150 PRINT:INPUT"IS THIS CORRECT (Y/N)";B$:IFB$<>"Y"THEN6
 0
•160 POKE770,198:POKE771,77:SYS4864:END
•170 DATA32,58,20,169,41,162,19,236,3,3,208,4,955
•180 DATA169,198,162,77,141,2,3,142,3,3,224,19,1143
•190 DATA208,7,32,125,255,79,78,0,96,32,125,255,1292
•200 DATA79,70,70,0,96,162,0,134,251,189,0,2,1053
•210 DATA240,19,201,48,144,9,201,58,176,5,133,251,1485
•220 DATA232,208,238,134,252,165,251,208,3,76,198,77,2042
•230 DATA169,0,166,235,164,236,133,253,133,254,142,47,193
 2
•240 DATA20,140,48,20,24,101,22,69,254,230,254,24,1206
•250 DATA101,23,69,254,170,230,254,164,252,185,0,2,1704
•260 DATA133,251,201,34,208,6,165,253,73,255,133,253,1965
•270 DATA201,32,208,4,165,253,240,8,138,24,101,251,1625
•280 DATA69,254,170,44,198,254,230,252,164,251,208,213,23
 07
•290 DATA138,41,240,74,74,74,74,24,105,65,141,88,1138
•300 DATA20,138,41,15,24,105,65,141,89,20,32,79,769
•310 DATA20,189,85,20,240,6,32,210,255,232,208,245,1742
•320 DATA174,47,20,172,48,20,24,32,240,255,173,93,1298
•330 DATA20,240,27,165,161,201,212,176,4,165,160,240,1771
•340 DATA17,32,65,20,238,32,208,238,1,214,32,225,1322
•350 DATA255,208,6,32,49,20,76,198,77,232,208,242,1603
•360 DATA200,208,239,32,66,193,173,95,20,162,96,160,1644
•370 DATA20,32,189,255,169,0,170,32,104,255,169,0,1395
•380 DATA174,94,20,168,32,186,255,169,45,174,16,18,1351
•390 DATA172,17,18,32,216,255,162,1,189,96,20,168,1346
•400 DATA200,152,201,58,144,2,169,48,157,96,20,201,1448
•410 DATA48,208,3,202,16,234,32,49,20,141,0,2,955
•420 DATA76,183,77,58,59,32,65,20,206,32,208,206,1222
•430 DATA1,214,169,0,170,168,76,219,255,32,79,20,1403
•440 DATA169,26,141,0,214,173,0,214,16,251,96,162,1462
•450 DATA0,142,0,255,96,19,18,32,32,32,32,146,804
•460 DATA0,1,0,0,65,72,79,89,33,0,0,0,339
```

FLANKSPEED FOR THE C-64 By GORDON F. WHEAT

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1–SAVEs what you have entered so far.

f3–LOADs in a program worked on previously.

f5–To continue on a line you stopped on after LOADing in the previous saved work.

f7–Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. It temporarily freezes the output as well.

```
·100 POKE53280,12:POKE53281,11                                    OP
·105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "]";          FP
·110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "
 ]"                                                               JP
·115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]"             FA
·120 PRINT"[RVSON][3" "]COPR. 1987, ION INTERNATIONAL INC.
 [3" "]"                                                          AJ
·125 FORA=54272TO54296:POKEA,0:NEXT                               ND
·130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO
 KE54296,15                                                       NP
·135 FORA=680TO699:READB:POKEA,B:NEXT                             FL
·140 DATA169,251,166,253,164,254,32,216,255,96                    FF
·145 DATA169,0,166,251,164,252,32,213,255,96                      EK
·150 B$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B              KP
·155 GOSUB480:IFB=0THEN150                                        OE
·160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16                    AM
·165 B$="ENDING ADDRESS IN HEX":GOSUB430:EN=B                     PE
·170 GOSUB470:IFB=0THEN150                                        PG
·175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16                        GM
·180 IFB>255THENB=B-255:POKE254,PEEK(254)+1                       HG
·185 POKE253,B:PRINT                                              EC
·190 REM  GET HEX LINE                                            ED
·195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8                     KD
·200 FORB=0TO1:GOTO250                                            IH
·205 NEXTB                                                        IJ
·210 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340                        FA
·215 PRINT" [c P][LEFT]";                                         EG
·220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "                        II
·225 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255                       GL
·230 NEXT                                                         GI
·235 IFA%(8)<>TTHENGOSUB375:GOTO195                               FL
·240 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOTO195                IM
·245 REM    GET HEX INPUT                                         PA
·250 GETA$:IFA$=""THEN250                                         GA
·255 IFA$=CHR$(20)THEN305                                         GO
·260 IFA$=CHR$(133)THEN535                                        LM
·265 IFA$=CHR$(134)THEN560                                        IG
·270 IFA$=CHR$(135)THENPRINT" ":GOTO620                           HO
·275 IFA$=CHR$(136)THENPRINT" ":GOTO635                           HE
·280 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO295                 MI
·285 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO295                 DJ
·290 GOSUB415:GOTO250                                             JA
·295 PRINTA$"[c P][LEFT]";                                        PK
·300 GOTO205                                                      FA
·305 IFA>0THEN320                                                 BI
·310 A=-1:IFB=1THEN330                                            BB
·315 GOTO220                                                      FA
·320 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1                       BF
·325 A=A-1                                                        FK
·330 PRINTCHR$(20);:GOTO220                                       PH
·335 REM LAST LINE                                                CP
·340 PRINT" ":T=AD-(INT(AD/256)*256)                              KH
·345 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255                     OD
·350 NEXT                                                         OB
·355 IFA%(A)<>TTHENGOSUB375:GOTO195                               LH
·360 FORB=0TOA-1:POKEAD+B,A%(B):NEXT                              BO
·365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535                       MB
·370 REM BELL AND ERROR MESSAGES                                  LM
·375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415          JK
·380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415               PG
·385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41
 5                                                                IK
·390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:
 GOTO415                                                          HK
·395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415               DM
·400 PRINT"?ERROR IN SAVE":GOTO415                                JK
·405 PRINT"?ERROR IN LOAD":GOTO415                                IO
·410 PRINT:PRINT:PRINT"END OF ML AREA":PRINT                      JO
·415 POKE54276,17:POKE54276,16:RETURN                             BF
·420 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA$:RETURN             DH
·425 REM GET FOUR DIGIT HEX                                       IM
·430 PRINT:PRINTB$;:INPUTT$                                       OL
·435 IFLEN(T$)<>4THENGOSUB380:GOTO430                             JD
·440 FORA=1TO4:A$=MID$(T$,A,1):GOSUB450:IFT(A)=16THENGOSUB
 380:GOTO430                                                      AK
·445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN          KB
·450 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RETURN                  GM
·455 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RETURN                  NJ
·460 T(A)=16:RETURN                                               IC
·465 REM ADDRESS CHECK                                            OL
·470 IFAD>ENTHEN385                                               HO
·475 IFB<SRORB>ENTHEN390                                          LE
·480 IFB<256OR(B>40960ANDB<49152)ORB>53247THEN395                 OB
·485 RETURN                                                       HE
·490 REM ADDRESS TO HEX                                           PM
·495 AC=AD:A=4096:GOSUB520                                        AP
·500 A=256:GOSUB520                                               NF
·505 A=16:GOSUB520                                                LG
·510 A=1:GOSUB520                                                 HE
·515 RETURN                                                       JD
·520 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO530                   OC
·525 A$=CHR$(T+48)                                                JI
·530 PRINTA$;:AC=AC-A*T:RETURN                                    AA
·535 A$="**SAVE**":GOSUB585                                       IC
·540 OPEN1,T,1,A$:SYS680:CLOSE1                                   AB
·545 IFST=0THENEND                                                FB
·550 GOSUB400:IFT=8THENGOSUB420                                   PM
·555 GOTO535                                                      FI
·560 A$="**LOAD**":GOSUB585                                       PE
·565 OPEN1,T,0,A$:SYS690:CLOSE1                                   PO
·570 IFST=64THEN195                                               OI
·575 GOSUB405:IFT=8THENGOSUB420                                   CO
·580 GOTO560                                                      GN
·585 PRINT" ":PRINTTAB(14)A$                                      KA
·590 PRINT:A$="":INPUT"FILENAME";A$                               IO
·595 IFA$=""THEN590                                               HK
·600 PRINT:PRINT"TAPE OR DISK?":PRINT                             HL
·605 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RETURN                 NP
·610 IFB$<>"T"THEN605                                             KO
·615 RETURN                                                       PH
·620 B$="CONTINUE FROM ADDRESS":GOSUB430:AD=B                     DD
·625 GOSUB475:IFB=0THEN620                                        NK
·630 PRINT:GOTO195                                                HN
·635 B$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B                     FK
·640 GOSUB475:IFB=0THEN635                                        LN
·645 PRINT:GOTO670                                                HI
·650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G
 OSUB410:GOTO195                                                  LM
·655 PRINT" ";:NEXTB                                              LE
·660 PRINT:AD=AD+8                                                CD
·665 GETB$:IFB$=CHR$(136)THEN195                                  JD
·670 GOSUB495:PRINT": ";:GOTO650                                  KE
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 77 and 78 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

SPRITESHELL 128

FROM PAGE 48

Warning! Read documentation carefully before entering these programs!

Starting address in hex: 1300
Ending address in hex: 1517

Flankspeed **required for entry! See page 79.**

SPRITESHELL 128

```
1300: 78 A9 19 8D 14 03 A9 13 9C
1308: 8D 15 03 AD F8 11 85 FB E6
1310: A9 01 85 FC 8D FD 11 58 32
1318: 60 C6 FB D0 2A AD F8 11 ED
1320: 85 FB AD F6 11 F0 20 A5 0E
1328: FC 18 6D F3 11 AE F9 11 69
1330: A4 D8 F0 06 9D F9 1F 4C A7
1338: 3D 13 9D F9 07 CA D0 F0 B3
1340: A9 01 38 E5 FC 85 FC AD 36
1348: F2 11 D0 03 4C 31 14 A2 54
1350: 00 AD FA 11 F0 0A A9 01 AF
1358: 38 ED FD 11 8D FD 11 AA D4
1360: BD 00 DC 29 0F 85 FD A9 60
1368: 0F 38 E5 FD 48 8A 0A AA 1B
1370: 68 C9 04 D0 16 DE D6 11 54
1378: D0 0E 8A 4A A8 C8 98 4D 83
1380: E6 11 8D E6 11 DE D6 11 C4
1388: 4C 31 14 C9 08 D0 16 FE D1
1390: D6 11 D0 0E 8A 4A A8 C8 9D
1398: 98 4D E6 11 8D E6 11 FE FA
13A0: D6 11 4C 31 14 C9 01 D0 B5
13A8: 07 E8 DE D6 11 4C 31 14 F0
13B0: C9 02 D0 07 E8 FE D6 11 24
13B8: 4C 31 14 C9 05 D0 1A DE E2
13C0: D6 11 D0 0E 8A 4A A8 C8 CD
13C8: 98 4D E6 11 8D E6 11 DE 0B
13D0: D6 11 E8 DE D6 11 4C 31 E5
13D8: 14 C9 06 D0 1A DE D6 11 6E
13E0: D0 0E 8A 4A A8 C8 98 4D EB
13E8: E6 11 8D E6 11 DE D6 11 2D
13F0: E8 FE D6 11 4C 31 14 C9 1C
13F8: 09 D0 1A FE D6 11 D0 0E B2
1400: 8A 4A A8 C8 98 4D E6 11 24
1408: 8D E6 11 FE D6 11 E8 DE 3C
1410: D6 11 4C 31 14 C9 0A D0 2E
1418: 18 FE D6 11 D0 0F 8A 8A 0C
1420: 4A A8 C8 98 4D E6 11 8D 47
1428: E6 11 FE D6 11 E8 FE D6 C5
1430: 11 AE FB 11 8E F4 11 AD 3F
1438: F4 11 0A AA 4A A8 B9 0E AD
1440: 15 2D E6 11 D0 14 BD D6 F3
1448: 11 38 CD EE 11 B0 0B AC C7
1450: EE 11 C8 98 9D D6 11 4C 83
1458: B3 14 8A 4A A8 B9 0E 15 7A
1460: 2D E6 11 F0 28 BD D6 11 44
1468: 38 CD EF 11 90 1F AC EF BB
1470: 11 88 98 9D D6 11 AD F4 CA
1478: 11 CD F7 11 D0 0F A9 FF E9
1480: AE F4 11 38 FD 0E 15 2D BB
1488: 15 D0 8D 15 D0 E8 BD D6 5F
1490: 11 38 CD F0 11 B0 0B AC 12
1498: F0 11 C8 98 9D D6 11 4C CD
14A0: B3 14 BD D6 11 38 CD F1 06
14A8: 11 90 1F AC F1 11 88 98 3A
14B0: 9D D6 11 AD F4 11 CD F7 AF
14B8: 11 D0 0F A9 FF AE F4 11 08
14C0: 38 FD 0E 15 2D 15 D0 8D BA
14C8: 15 D0 CE F4 11 30 03 4C 03
14D0: 37 14 4C 65 FA 8D EE 11 56
14D8: 8E EF 11 60 8D F0 11 8E E6
14E0: F1 11 60 8D F8 11 8A 38 9E
14E8: C9 06 90 02 A9 06 8D F9 82
14F0: 11 8C F3 11 60 8D F2 11 85
14F8: 8E F6 11 8C FA 11 60 8D 16
1500: F7 11 8A 38 C9 07 90 02 2F
1508: A9 07 8D FB 11 60 01 02 B6
1510: 04 08 10 20 40 80 00 00 0D
```

SHELL DEMO

```
·10 REM SPRITESHELL 128 DEMO                              LH
·20 REM CLEVE BLAKEMORE                                   KJ
·30 REM 5765 TIVOLI CIRCLE APT. #103                      CN
·40 REM RICHMOND,VA. 23227                                DC
·50 :                                                     GM
·60 REM MAKE SURE THESE FILES BELOW EXIST
  ON DISK BEFORE RUNNING THIS PROGRAM                     JB
·70 :                                                     IA
·80 BLOAD"SPRITESHELL 128                                 IJ
·90 BLOAD"DEMO.SPRITES                                    BL
·100 :                                                    JO
·110 XB=5333:YB=5340                                      AO
·120 SPRTG=5347                                           IP
·130 FLAGS=5365:CFLAGS=5375:SHELL=4864                    EK
·140 :                                                    MG
·150 SYS XB,24,60                                         NC
·160 SYS YB,50,220                                        BC
·170 SYS SPRTG,5,6,58                                     BM
·180 SYS FLAGS,1,1,1                                      KH
·190 SYS CFLAGS,8,7                                       LM
·200 COLOR0,1:COLOR1,3:COLOR4,1:GRAPHIC1,
 1                                                        DK
·210 BOX1,0,0,310,190:SPRSAV3,A$:SPRSAVA$
 ,4:SPRSAV2,A$:SPRSAVA$,3:SPRSAV1,A$:SPRS
 AVA$,2                                                   BA
·220 FORX=3TO8:MOVSPRX,173,140:MOVSPRX,60
 ;(X-1)*45:SPRITEX,1,X:NEXT                               EO
·230 FORX=1TO2:MOVSPRX,173,140:SPRITEX,1,
 2:NEXT                                                   NH
```

```
•240 SYS SHELL                                    AI
•250 MOVSPR((RND(1)*6)+3),(RND(1)*8)*45#1
:GOTO250                                          AF
```

DEMO.SPRITES

Starting address in hex: 0E00
Ending address in hex: 0EC0

```
0E00: 00 00 00 00 00 00 00 00 00
0E08: 00 00 18 00 00 3C 00 00 5C
0E10: 3C 00 00 3C 00 00 18 00 A0
0E18: 00 7E 00 00 FF 00 01 BD 55
0E20: 80 03 BC C0 03 3C C0 03 24
0E28: 18 C0 02 3C 40 00 7E 00 FD
0E30: 00 C3 00 01 81 80 01 81 79
0E38: 80 01 81 80 03 81 C0 00 01
0E40: 00 00 00 00 00 00 00 00 40
0E48: 00 00 00 00 00 00 00 10 58
0E50: 00 10 38 00 38 7C 00 7C C9
0E58: 4E 6C E4 07 39 C0 03 FF FB
0E60: 80 01 FF 00 00 38 00 00 1A
0E68: 00 00 00 00 00 00 00 00 68
0E70: 00 00 00 00 00 00 00 00 70
0E78: 00 00 00 00 00 00 00 10 88
0E80: 00 00 00 00 00 00 00 00 80
0E88: 00 00 00 00 00 00 00 00 88
0E90: 00 00 00 00 00 00 00 00 90
0E98: 1E 6C F0 3F 39 F8 73 FF F8
0EA0: 9C 41 FF 04 00 38 00 00 BA
0EA8: 00 00 00 00 00 00 00 00 A8
0EB0: 00 00 00 00 00 00 00 00 B0
0EB8: 00 00 00 00 00 00 00 10 C8
0EC0: 01 C1
```

THE 128 VERSUS THE CLONES

FROM PAGE 32

BENCHMARKS GALORE

```
•1 REM                                            IO
•2 REM   BENCHMARKS GALORE                        FH
•3 REM   RUPERT REPORT #45                        MH
•4 REM        C-128                               JC
•5 REM                                            JC
•6 OPEN4,4                                        DE
•10 FOR B=1 TO 11                                 LL
•20 FAST : T0=TI                                  CN
•30 ON B GOSUB 100,200,300,400,500,600,70
0,800,900,1000,1100                               OH
•40 PRINT#4, "BENCHMARK #";B                      OH
•50 PRINT#4, (TI-T0)/60;"SECONDS"                 OF
•60 NEXT B                                        PI
•70 PRINT#4 : CLOSE 4 : END                       OH
•100 REM #1 - SIMPLE FOR/NEXT LOOP                HL
•110 FOR N=1 TO 10000 : NEXT N                    NL
•120 RETURN                                       AG
•200 REM #2 - FLOATING POINT MATH                 ND
•210 FOR N=1 TO 1000                              ON
•220 K=K+(K-.6)*K/(K+.03)                         GD
•230 NEXT : RETURN                                DF
•300 REM #3 - STRING MANIPULATIONS                EF
•310 FOR N=1 TO 1000                              EG
•320 N$=MID$(LEFT$(N$+"AHOY",3),2,1)              NH
•330 NEXT : RETURN                                JI
•400 REM #4 - DISK WRITE                          GI
•410 DOPEN #1,"@TEST,S",W                         OL
•420 FOR N=1 TO 1000                              LM
•430 PRINT#1,N                                    PH
•440 NEXT : DCLOSE : RETURN                       EC
•500 REM #5 - DISK READ                           DL
•510 DOPEN #1,"TEST,S"                            JN
•520 FOR N=1 TO 1000                              CF
•530 INPUT#1,K                                    EJ
•540 NEXT : DCLOSE : RETURN                       KH
•600 REM #6 - VERTICAL PRINTING                   AL
•610 FOR N=1 TO 1000                              IP
•620 PRINT N                                      FP
•630 NEXT : RETURN                                LP
•700 REM #7 - HORIZONTAL PRINTING                 OP
•710 FOR N=1 TO 1000                              ND
•720 PRINT N;                                     PL
•730 NEXT : RETURN                                CD
•800 REM #8 - RANDOM NUMBERS                      CJ
•810 FOR N=1 TO 1000                              EE
•820 K=RND(0)*320 : K=RND(0)*200                  BC
•830 NEXT : RETURN                                IG
•900 REM #9 - RANDOM POINTS                       DG
•910 GRAPHIC 0 : GRAPHIC 1,1                      EC
•920 FOR N=1 TO 1000                              KK
•930 DRAW,RND(0)*320,RND(0)*200                   JM
•940 NEXT                                         DB
•950 GRAPHIC 0 : GRAPHIC 5 : RETURN               NP
•1000 REM #10 - RANDOM LINES                      GG
•1010 GRAPHIC 0 : GRAPHIC 1,1                     KG
•1020 FOR N=1 TO 100                              NF
•1030 DRAW,RND(0)*320,RND(0)*200 TO RND(0
)*320,RND(0)*200                                  FN
•1040 NEXT                                        JG
•1050 GRAPHIC 0 : GRAPHIC 5 : RETURN              DO
•1100 REM #11 - RANDOM CIRCLES                    FB
•1110 GRAPHIC 0 : GRAPHIC 1,1                     BJ
•1120 FOR N=1 TO 50                               CK
•1130 CIRCLE,RND(0)*320,RND(0)*200,RND(0)
*50                                               BD
•1140 NEXT                                        PK
•1150 GRAPHIC 0 : GRAPHIC 5 : RETURN              KC
```

HOOPS
FROM PAGE 18

Starting address in hex: C000
Ending address in hex: C7E7
SYS to start: 49152

***Flankspeed* required for entry! See page 79.**

```
C000: A9 8E 20 D2 FF A9 08 20 FC
C008: D2 FF A0 00 B9 E2 C6 99 78
C010: 00 3F C8 D0 F7 A0 18 B9 53
C018: FA C4 99 00 D4 88 10 F7 D6
C020: A9 00 8D 17 D0 8D 1B D0 B8
C028: A9 03 8D 1C D0 8D 1D D0 CA
C030: A2 05 BD 87 C4 9D 27 D0 77
C038: BD 8D C4 9D F8 07 CA 10 C0
C040: F1 A9 02 8D 25 D0 A9 0C 17
C048: 8D 26 D0 A9 00 8D 20 D0 F4
C050: 8D 21 D0 A0 07 99 7F C4 55
C058: 88 10 FA A9 8D A0 C5 20 A9
C060: D0 C3 A2 09 A0 01 18 20 7A
C068: F0 FF A9 13 A0 C5 20 D0 6D
C070: C3 A2 09 A0 26 18 20 F0 CF
C078: FF A9 2D A0 C5 20 D0 C3 6A
C080: 20 E6 C3 20 6E C3 A9 AB F2
C088: 8D 73 C4 A9 78 8D 6D C4 30
C090: A9 61 8D 75 C4 A9 F8 8D 93
C098: 76 C4 A9 00 8D 79 C4 8D D6
C0A0: 7B C4 8D 7C C4 20 2E C4 C2
C0A8: A9 33 8D 15 D0 A9 04 8D 34
C0B0: 82 C4 A5 A2 29 01 09 04 77
C0B8: 8D 83 C4 A2 0C A0 0C 18 02
C0C0: 20 F0 FF A9 4D A0 C5 A2 D1
C0C8: 33 20 2D C3 38 E9 31 8D ED
C0D0: 7D C4 A8 D0 29 A2 0C A0 05
C0D8: 0D 18 20 F0 FF A9 5F A0 B8
C0E0: C5 A2 37 20 2D C3 8D 78 97
C0E8: C5 38 E9 2A 8D 7E C4 A2 6E
C0F0: 06 A0 10 18 20 F0 FF A9 7A
C0F8: 6F A0 C5 20 D0 C3 A9 3F 6C
C100: 8D 15 D0 E6 04 A5 04 29 31
C108: 07 D0 18 AD 00 DC A2 00 25
C110: 20 2F C1 AD 01 DC AE 7D D8
C118: C4 D0 03 20 6A C1 A2 01 A0
C120: 20 2F C1 20 8D C1 20 88 49
C128: C2 20 2E C4 4C 03 C1 29 38
C130: 0C 4A 4A A8 18 BD 75 C4 89
C138: 79 9B C4 85 02 BD 7B C4 97
C140: 79 9F C4 85 03 38 A5 02 86
C148: FD 93 C4 A5 03 FD 95 C4 9F
C150: 90 17 38 A5 02 FD 97 C4 32
C158: A5 03 FD 99 C4 B0 0A A5 BD
C160: 02 9D 75 C4 A5 03 9D 7B FB
C168: C4 60 18 AD 73 C4 6D 7E 77
C170: C4 85 02 AD 79 C4 69 00 12
C178: 85 03 A0 07 38 AD 76 C4 C9
C180: E5 02 AD 7C C4 E5 03 90 D0
C188: 02 A0 0B 98 60 18 AD 81 76
C190: C4 69 02 A8 AD 82 C4 69 C7
C198: 00 C9 0A B0 06 8C 81 C4 F5
C1A0: 8D 82 C4 AC 82 C4 A5 04 13
C1A8: 39 A3 C4 D0 5F 18 AD 6D AD
C1B0: C4 79 AD C4 A8 AE 73 C4 F0
C1B8: AD 79 C4 20 4A C2 C9 20 BB
C1C0: F0 2C C9 02 B0 33 CD 84 DF
C1C8: C4 F0 26 AC 82 C4 C0 05 5E
C1D0: 90 1C 48 AA FE 7F C4 20 D3
C1D8: 6E C3 A9 00 8D 81 C4 A9 32
C1E0: 05 8D 82 C4 A0 80 8C 0B 73
C1E8: D4 C8 8C 0B D4 68 8D 84 6D
C1F0: C4 A5 FB 8D 6D C4 4C 0C 6F
C1F8: C2 A5 A2 29 0F 8D 81 C4 10
C200: AC 82 C4 B9 C1 C4 8D 82 44
C208: C4 20 1A C3 AC 83 C4 A5 65
C210: 04 39 A3 C4 D0 33 18 AD 7F
C218: 73 C4 79 AD C4 AA AD 79 0E
C220: C4 79 B7 C4 AC 6D C4 20 D9
C228: 4A C2 C9 02 90 1B C9 20 96
C230: D0 0B A5 FC 8D 73 C4 A5 1A
C238: FD 8D 79 C4 60 AC 83 C4 57
C240: B9 C1 C4 8D 83 C4 20 1A 90
C248: C3 60 84 FB 86 FC 85 FD F3
C250: A9 00 85 3B A9 04 85 3C 2A
C258: 38 98 E9 21 4A 4A 4A A8 BB
C260: F0 10 18 A5 3B 69 28 85 71
C268: 3B A5 3C 69 00 85 3C 88 39
C270: D0 F0 38 8A E9 0C 85 FE 6F
C278: A5 FD E9 00 4A 66 FE 46 FB
C280: FE 46 FE A4 FE B1 3B 60 B5
C288: AD 6D C4 C9 DC 90 5D AD AA
C290: 7F C4 C9 15 B0 07 AD 80 99
C298: C4 C9 15 90 05 68 68 4C EE
C2A0: ED C2 A2 01 AD 79 C4 D0 B1
C2A8: 08 AD 73 C4 C9 AB B0 01 BD
C2B0: CA 18 BD 75 C4 69 12 85 8C
C2B8: 02 BD 7B C4 69 00 85 03 AA
C2C0: 38 A5 02 ED 73 C4 85 02 4E
C2C8: A5 03 ED 79 C4 D0 1D 38 C3
C2D0: A9 24 E5 02 C9 25 B0 14 3A
C2D8: 4A 4A 8D 83 C4 A5 A2 29 B4
C2E0: 3F 8D 81 C4 A9 00 8D 82 AD
C2E8: C4 20 1A C3 60 A2 0C A0 5B
C2F0: 0C 18 20 F0 FF EE 86 02 9D
C2F8: A0 00 B9 7B C5 F0 EE 20 94
C300: D2 FF A5 A2 C5 A2 F0 FC 71
C308: C8 AD 00 DC 29 10 F0 07 8C
C310: AD 01 DC 29 10 D0 E3 4C D5
C318: 4B C0 A2 40 A0 80 8E 04 BA
C320: D4 8C 12 D4 E8 C8 8E 04 AC
C328: D4 8C 12 D4 60 86 05 20 7C
C330: D0 C3 A9 00 85 C6 A5 A2 03
C338: 29 10 85 C7 A9 20 20 D2 7B
C340: FF A9 9D 20 D2 FF A9 00 24
C348: 85 C7 20 E4 FF C9 31 90 26
C350: E5 C5 05 B0 E1 48 20 D2 CE
C358: FF 18 A5 A2 69 28 C5 A2 B2
```

```
C360: D0 FC A2 0F A9 20 9D EC 34
C368: 05 CA 10 FA 68 60 AD 7F 39
C370: C4 20 C3 C3 48 A0 2A A9 99
C378: 04 20 99 C3 68 AA A0 2E DB
C380: A9 04 20 99 C3 AD 80 C4 9E
C388: 20 C3 C3 48 A0 47 A9 04 0E
C390: 20 99 C3 68 AA A0 4B A9 B6
C398: 04 84 3B 85 3C 8A 0A AA 5D
C3A0: BD E6 C4 8D 85 C4 BD E7 87
C3A8: C4 8D 86 C4 A2 0E A9 20 C0
C3B0: 4E 86 C4 6E 85 C4 90 02 95
C3B8: A9 51 BC D7 C4 91 3B CA A4
C3C0: 10 EC 60 A2 00 C9 0A 90 25
C3C8: 06 E9 0A E8 4C C5 C3 60 E1
C3D0: 85 39 84 3A A0 00 B1 39 D9
C3D8: F0 0B 20 D2 FF C8 D0 F6 58
C3E0: E6 3A 4C D6 C3 60 A9 18 0B
C3E8: 85 3B 85 A7 A9 05 85 3C 47
C3F0: A9 D9 85 A8 A2 11 A9 74 74
C3F8: A0 00 91 3B A9 0C 91 A7 55
C400: A0 27 91 A7 A9 6A 91 3B E1
C408: 18 A5 3B 69 28 85 3B 85 D8
C410: A7 A5 3C 69 00 85 3C 29 ED
C418: 03 09 D8 85 A8 CA D0 D6 9D
C420: A9 A0 99 C0 07 A9 0C 99 1B
C428: C0 DB 88 10 F3 60 AD 6D CC
C430: C4 8D 6E C4 AD 73 C4 8D 29
C438: 74 C4 AD 79 C4 8D 7A C4 2A
C440: A2 05 8A 0A A8 BD 6B C4 13
C448: 99 01 D0 BD 71 C4 99 00 41
C450: D0 AD 10 D0 3D D1 C4 A8 2C
C458: BD 77 C4 29 01 F0 05 98 0B
C460: 1D CB C4 A8 8C 10 D0 CA EE
C468: 10 D8 60 99 99 00 00 DC C1
C470: DC 2E 16 00 00 00 00 00 91
C478: 01 00 00 00 00 00 00 00 79
C480: 00 00 00 00 00 00 00 01 81
C488: 01 09 08 02 07 FC FC FE 9C
C490: FD FF FF 1B B9 00 00 A0 04
C498: 3E 00 01 00 01 FF 00 00 D8
C4A0: 00 FF 00 01 03 07 0F 1F D9
C4A8: 1F 0F 07 03 01 FF FF FF E1
C4B0: FF FF 01 01 01 01 01 FF B5
C4B8: FF FF FF FF 00 00 00 00 B8
C4C0: 00 08 07 06 05 05 04 04 E7
C4C8: 03 02 01 01 02 04 08 10 ED
C4D0: 20 FE FD FB F7 EF DF 00 B1
C4D8: 01 02 28 29 2A 50 51 52 4B
C4E0: 78 79 7A A0 A1 A2 6F 7B 1D
C4E8: 97 2C E7 73 CF 73 C9 5B 70
C4F0: CF 79 EF 79 92 72 EF 7B 14
C4F8: CF 7B 00 08 00 0C 00 08 60
C500: 00 C8 F3 00 00 00 68 00 25
C508: 00 06 00 00 00 17 00 00 25
C510: 2D F5 2F 05 12 A1 11 9D C9
C518: A1 11 9D A1 11 9D A1 11 6B
C520: 9D A1 92 1C CF 90 41 41 F0
C528: 41 41 41 5A 00 05 A1 11 FD
C530: 9D A1 11 9D A1 11 9D A1 10
C538: 11 9D 9D 9D 9D 9D 9D 9D 98
C540: 9D 90 5A 40 40 40 40 40 0A
C548: 1C D0 05 A1 00 9F 50 4C 18
C550: 41 59 45 52 53 20 28 31 4F
C558: 2F 32 29 20 20 05 00 96 BE
C560: 4C 45 56 45 4C 20 28 31 53
C568: 2D 36 29 20 20 05 00 1F 59
C570: 12 4C 45 56 45 4C 20 20 3C
C578: 20 92 00 50 52 45 53 53 B9
C580: 20 46 49 52 45 20 42 55 7F
C588: 54 54 4F 4E 00 93 12 1F 93
C590: 20 AC A2 A2 A2 A2 A2 A2 2D
C598: A2 BB A7 B8 B8 B8 B8 B8 3A
C5A0: B8 B8 B8 B8 B8 B8 B8 B8 66
C5A8: B8 B8 B8 B8 B8 A5 AC A2 39
C5B0: A2 A2 A2 A2 A2 A2 BB 20 5C
C5B8: 12 20 92 A1 05 20 20 20 84
C5C0: 20 20 20 20 12 1F A1 A7 BB
C5C8: 20 20 B0 C3 C3 C3 C3 C3 8C
C5D0: C3 C3 C3 C3 C3 C3 C3 AE D9
C5D8: 20 20 A5 92 A1 05 20 20 38
C5E0: 20 20 20 20 20 12 1F A1 54
C5E8: 20 20 92 A1 05 20 20 20 C2
C5F0: 20 20 20 20 12 1F A1 A7 EB
C5F8: 20 20 C2 92 99 20 AE B0 A7
C600: D5 C9 D5 C9 B2 C9 D5 C9 5B
C608: 20 1F 12 C2 20 20 A5 92 94
C610: A1 05 20 20 20 20 20 20 77
C618: 20 12 1F A1 20 20 92 A1 7F
C620: 05 20 20 20 20 20 20 20 06
C628: 12 1F A1 A7 20 20 C2 92 38
C630: 99 20 AB B3 C2 C2 C2 C2 54
C638: AB CB CA C9 20 1F 12 C2 58
C640: 20 20 A5 92 A1 05 20 20 9F
C648: 20 20 20 20 20 12 1F A1 BB
C650: 20 20 92 A1 05 20 20 20 2A
C658: 20 20 20 20 12 1F A1 A7 53
C660: 20 20 C2 92 99 20 BD AD 1B
C668: CA CB CA CB B1 20 CA CB FD
C670: 20 1F 12 C2 20 20 A5 92 FC
C678: A1 05 20 20 20 20 20 20 DF
C680: 20 12 1F A1 20 20 92 A1 E7
C688: 05 20 20 20 20 20 20 20 6E
C690: 12 1F A1 A7 20 20 AD C3 BC
C698: C3 C3 C3 C3 C3 C3 C3 C3 B6
C6A0: C3 C3 C3 BD 20 20 A5 92 22
C6A8: A1 05 20 20 20 20 20 20 10
C6B0: 20 12 1F A1 20 20 BC 92 33
C6B8: A2 A2 A2 A2 A2 A2 A2 12 3D
C6C0: BE A7 20 20 20 20 20 20 E7
C6C8: 20 20 20 20 20 20 20 20 C9
C6D0: 20 20 20 20 A5 BC 92 A2 E8
C6D8: A2 A2 A2 A2 A2 A2 12 BE 79
C6E0: 20 00 00 00 00 55 55 54 FF
C6E8: 55 55 54 CC CC CC 88 88 5F
C6F0: 88 8B 8B 88 B8 B8 B8 88 CB
C6F8: 88 88 CC CC CC 22 22 20 D4
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 77 and 78 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
C700: 2E 2E 20 22 E2 E0 22 22 A6
C708: 20 33 33 30 08 88 80 08 D7
C710: B8 80 0B 8B 80 0C CC C0 F9
C718: 02 22 00 02 EE 00 03 23 53
C720: 00 26 00 00 00 00 00 00 46
C728: 00 00 00 00 00 00 00 00 28
C730: 00 00 00 00 00 00 00 00 30
C738: 00 00 00 00 00 00 00 00 38
C740: 00 7F 00 01 FF C0 03 FF 84
C748: E0 07 FF F0 07 FF F0 07 20
C750: FF F0 07 FF F0 07 FF F0 31
C758: 03 FF E0 01 FF C0 00 7F 7D
C760: 00 26 00 00 00 00 00 00 86
C768: 00 00 00 00 00 00 00 00 68
C770: 00 00 00 00 00 00 00 00 70
C778: 00 00 00 00 00 00 00 00 78
C780: 00 7F 00 01 88 C0 02 88 D4
C788: A0 04 49 10 04 49 10 07 EA
C790: FF F0 04 49 10 04 49 10 3C
C798: 02 88 A0 01 88 C0 00 7F 8D
C7A0: 00 26 00 00 00 00 00 00 C6
C7A8: 00 00 00 00 00 00 00 00 A8
C7B0: 00 00 00 00 00 00 00 00 B0
C7B8: 00 00 00 00 00 00 00 00 B8
C7C0: 00 00 00 00 00 00 00 00 C0
C7C8: 00 00 00 00 01 FF 80 0F 59
C7D0: FF F0 3F FF FC 7F FF FE 7C
C7D8: FF FF FF FF FF FF FF FF D8
C7E0: FF 00 00 00 00 00 00 00 E0
```

CENTERFOLD
FROM PAGE 22

```
·10 REM *** CENTERFOLD *** BUCK CHILDRESS
 ***                                          FH
·20 REM *** P.O. BOX 13575 SALEM, OR 9730
 9 ***                                        OA
·30 PRINTCHR$(147)"LOADING AND CHECKING D
 ATA LINE:":D=49152                           PA
·40 FORA=0TO11:READB                          PN
·50 IFA=0THENF=PEEK(64)*256+PEEK(63):PRIN
 TCHR$(19)TAB(31)F:PRINT                      AM
·60 IFB<0ORB>255THEN80                        FI
·70 POKED+A,B:E=E+B:C=C+1:NEXTA:READB:IFB
 =ETHEN90                                     CI
·80 PRINT"ERROR IN DATA LINE:"F:END           PA
·90 E=0:D=D+12:IFC<312THEN40                  CL
·100 PRINT"THE DATA IS OK[3"."]":PRINT        FB
·110 PRINT"SYS 49152 TO ACTIVATE[3"."]":E
 ND                                           OB
·120 DATA169,18,162,192,160,0,120,141,143
 ,2,142,144,1393                              NC
·130 DATA2,140,49,193,88,96,173,49,193,20
 8,28,165,1384                                MG
·140 DATA207,208,24,173,141,2,174,50,193,
 141,50,193,1556                              FD
·150 DATA236,50,193,240,10,201,5,208,9,14
 1,49,193,1535                                CO
·160 DATA32,67,192,76,72,235,201,6,208,24
 9,141,49,1528                                II
·170 DATA193,32,94,192,76,72,235,173,32,2
 08,141,51,1499                               BK
·180 DATA193,24,105,8,141,32,208,32,242,1
 92,173,51,1401                               CG
·190 DATA193,141,32,208,169,0,141,49,193,
 96,169,0,1391                                FO
·200 DATA166,214,164,211,141,52,193,142,5
 3,193,140,54,1723                            PJ
·210 DATA193,32,68,229,32,11,193,140,60,1
 93,173,52,1376                               CC
·220 DATA193,141,55,193,172,55,193,177,10
 7,141,56,193,1676                            OD
·230 DATA177,111,141,58,193,169,39,56,237
 ,55,193,168,1597                             PA
·240 DATA177,107,141,57,193,177,111,141,5
 9,193,169,19,1544                            KM
·250 DATA56,237,52,193,24,109,55,193,168,
 173,56,193,1509                              MF
·260 DATA145,105,173,58,193,145,109,169,2
 0,24,109,52,1302                             FE
·270 DATA193,56,237,55,193,168,173,57,193
 ,145,105,173,1748                            DN
·280 DATA59,193,145,109,206,55,193,16,179
 ,165,105,24,1449                             NK
·290 DATA105,40,32,31,193,144,3,32,40,193
 ,206,60,1079                                 GN
·300 DATA193,208,155,238,52,193,173,52,19
 3,201,20,208,1886                            NI
·310 DATA139,174,53,193,172,54,193,24,32,
 240,255,76,1605                              LP
·320 DATA88,192,32,11,193,168,177,105,145
 ,107,177,109,1504                            LJ
·330 DATA145,111,200,208,245,32,40,193,16
 5,106,201,8,1654                             LI
·340 DATA144,236,96,169,4,162,194,133,106
 ,134,108,169,1655                            KO
·350 DATA216,162,198,160,25,133,110,134,1
 12,169,0,133,1552                            OL
·360 DATA105,133,107,133,109,133,111,96,2
 30,106,230,108,1601                          MK
·370 DATA230,110,230,112,96,0,0,0,0,0,0,0
 ,778                                         EL
```

PROBLEMS ENTERING A PROGRAM?

Help is available from the *Ahoy!* Programming Department at 212-239-6089 (if busy or no answer after three rings call 212-239-0855).

CRYSTALLUS
FROM PAGE 16

Starting address in hex: C000
Ending address in hex: CA48
SYS to start: 49152

***Flankspeed* required for entry! See page 79.**

```
C000: 20 7D C5 20 5B C3 20 D5 98
C008: C6 20 0C C2 AD 49 C1 F0 67
C010: 0A A9 00 8D 49 C1 A9 20 26
C018: 20 ED C1 AD 4A C1 C9 24 8F
C020: D0 03 20 10 C3 AD 1D C1 74
C028: F0 03 4C D7 C0 20 9C C1 7F
C030: 20 39 C0 20 C1 C0 4C 09 42
C038: C0 EE 1B C1 AD 1B C1 D0 20
C040: F8 EE 1C C1 AD 1C C1 C9 5B
C048: 18 D0 EE A9 00 8D 1C C1 35
C050: AD 1A C1 F0 11 CE 1A C1 86
C058: A2 00 BD 77 C0 9D C1 34 84
C060: E8 E0 06 D0 F5 60 A2 00 F9
C068: BD 7D C0 9D C1 34 E8 E0 C1
C070: 06 D0 F5 EE 1A C1 60 08 70
C078: 80 3E BC 02 20 20 02 BC F4
C080: 3E 80 08 10 12 05 13 13 94
C088: 20 06 09 12 05 20 20 14 23
C090: 0F 20 10 0C 01 19 20 19 2F
C098: 0F 15 20 08 01 16 05 20 21
C0A0: 05 13 03 01 10 05 04 21 F6
C0A8: 20 20 03 12 19 13 14 01 3F
C0B0: 0C 0C 15 13 20 02 0F 02 24
C0B8: 20 02 0C 01 03 0B 0D 05 08
C0C0: 12 AD 09 C2 C9 3D D0 04 28
C0C8: EE 1D C1 60 AD 09 C2 C9 3A
C0D0: 03 D0 03 EE 1D C1 60 A2 78
C0D8: 00 BD 83 C0 9D DA 06 BD 17
C0E0: 96 C0 9D AA 04 E8 E0 13 61
C0E8: D0 EF 20 8D C2 20 10 C3 0E
C0F0: 20 39 C0 20 9C C1 EE 22 9A
C0F8: D0 AD 00 DC C9 6F D0 EA 49
C100: A9 01 8D 0F C3 20 10 C3 FE
C108: A2 00 A9 A0 9D DA 06 9D 11
C110: AA 04 E8 E0 13 D0 F5 4C AE
C118: 03 C0 00 00 00 00 A2 00 7E
C120: AD D6 6B DD 43 C1 F0 0B EE
C128: E8 E0 04 D0 F3 A9 01 8D F2
C130: 47 C1 60 BD 43 C1 C9 98 BE
C138: D0 03 EE 49 C1 A9 00 8D 3D
C140: 47 C1 60 20 9A 8E 98 00 8B
C148: 00 00 00 AD EE C1 8D 21 55
C150: C1 AD EF C1 8D 22 C1 AD 90
C158: 21 C1 18 6D 48 C1 8D 21 79
C160: C1 B0 03 4C 69 C1 EE 22 5E
C168: C1 20 1E C1 60 AD EE C1 E8
C170: 8D 21 C1 AD EF C1 8D 22 EF
C178: C1 AD 21 C1 38 ED 48 C1 FA
C180: 8D 21 C1 90 03 4C 8B C1 1E
C188: CE 22 C1 20 1E C1 60 AD 49
C190: 21 C1 8D EE C1 AD 22 C1 43
C198: 8D EF C1 60 AD 08 C2 85 36
C1A0: FB A9 60 85 FC AE 09 C2 A3
C1A8: E0 00 F0 10 A5 FB 18 69 AD
C1B0: 58 85 FB A5 FC 69 00 85 1C
C1B8: FC CA D0 F0 A9 D1 85 02 45
C1C0: A9 04 85 03 A2 0C A0 14 5A
C1C8: B1 FB 91 02 88 10 F9 18 B4
C1D0: A5 02 69 28 85 02 A5 03 3A
C1D8: 69 00 85 03 18 A5 FB 69 ED
C1E0: 58 85 FB A5 FC 69 00 85 4C
C1E8: FC CA 10 DA 60 8D 2F 6C 25
C1F0: EE 4A C1 A0 00 20 10 C3 80
C1F8: C8 C0 02 D0 F8 AD 4A C1 08
C200: C9 24 D0 03 20 B3 C2 60 B8
C208: FF FF 00 60 AD 00 DC C9 BC
C210: 7F F0 F8 8D 0A C2 C9 7E 1C
C218: D0 16 20 8D C2 A9 58 8D FE
C220: 48 C1 20 6D C1 AD 47 C1 30
C228: D0 E1 20 8F C1 CE 09 C2 E6
C230: AD 0A C2 C9 7D D0 16 20 F8
C238: 8D C2 A9 58 8D 48 C1 20 42
C240: 4B C1 AD 47 C1 D0 C4 20 B9
C248: 8F C1 EE 09 C2 AD 0A C2 CE
C250: C9 7B D0 16 20 A0 C2 A9 A9
C258: 01 8D 48 C1 20 6D C1 AD ED
C260: 47 C1 D0 23 20 8F C1 CE 9D
C268: 08 C2 AD 0A C2 C9 77 D0 BF
C270: 16 20 A0 C2 A9 01 8D 48 8A
C278: C1 20 4B C1 AD 47 C1 D0 EE
C280: 06 20 8F C1 EE 08 C2 A9 5B
C288: 00 8D 0A C2 60 AD F8 07 F0
C290: C9 E2 D0 06 A9 E3 8D F8 28
C298: 07 60 A9 E2 8D F8 07 60 7A
C2A0: AD F8 07 C9 E0 D0 06 A9 79
C2A8: E1 8D F8 07 60 A9 E0 8D 90
C2B0: F8 07 60 20 39 C0 AD 1B F3
C2B8: D4 C9 C0 90 05 A2 03 4C 9F
C2C0: D6 C2 C9 80 90 05 A2 02 DE
C2C8: 4C D6 C2 C9 40 90 05 A2 F0
C2D0: 01 4C D6 C2 A2 00 BD FE 17
C2D8: C2 8D F3 C2 BD 06 C3 8D F4
C2E0: F4 C2 BD 02 C3 8D F6 C2 63
C2E8: BD 0A C3 8D F7 C2 A2 00 5F
C2F0: A9 20 9D 00 60 9D 00 60 B6
C2F8: E8 E0 02 D0 F5 60 3A 6C 92
C300: BA EC 3F 28 A3 90 65 65 0E
C308: 75 75 77 77 63 63 00 00 A8
C310: AD 0F C3 D0 29 EE 0F C3 4C
C318: AE 0E C3 BD 7D C4 8D 00 26
C320: D4 BD BD C4 8D 01 D4 BD 56
C328: FD C4 8D 07 D4 BD 3D C5 15
C330: 8D 08 D4 A9 41 8D 04 D4 EB
C338: A9 21 8D 0B D4 60 CE 0F AE
C340: C3 A9 40 8D 04 D4 A9 20 1E
C348: 8D 0B D4 EE 0E C3 AD 0E 32
```

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C350: C3 C9 40 D0 05 A9 00 8D 2B
C358: 0E C3 60 A2 00 8A 9D 00 55
C360: 38 E8 E0 00 D0 F8 A2 00 CE
C368: BD 09 C4 9D 00 38 BD 26 AD
C370: C4 9D 40 38 BD 43 C4 9D AE
C378: 80 38 BD 60 C4 9D C0 38 AA
C380: E8 E0 1D D0 E3 A2 00 BD 7C
C388: DE C3 9D 00 D0 E8 E0 2B 8E
C390: D0 F5 A9 1D 8D 09 C2 8D 05
C398: 08 C2 A9 E0 8D F8 07 A9 25
C3A0: 00 8D 4A C1 8D 1D C1 8D 34
C3A8: 47 C1 8D 49 C1 A9 2F 8D B0
C3B0: EE C1 A9 6C 8D EF C1 A2 59
C3B8: 00 BD C5 C3 9D 00 D4 E8 5B
C3C0: E0 19 D0 F5 60 00 00 00 E1
C3C8: 08 40 09 09 00 00 00 00 23
C3D0: 20 09 59 80 80 00 00 80 D4
C3D8: 80 00 00 00 00 8F AF 89 22
C3E0: 00 00 00 00 00 00 00 00 E0
C3E8: 00 00 00 00 00 00 00 1B 04
C3F0: 00 00 00 01 D8 00 1D 00 E7
C3F8: 00 01 01 00 00 00 00 09 04
C400: 00 07 01 05 00 07 00 07 1B
C408: 07 00 00 00 08 00 00 08 1F
C410: 00 00 00 00 00 04 00 00 14
C418: 37 00 00 04 00 00 11 00 64
C420: 00 40 40 00 C0 C0 08 00 2A
C428: 00 08 00 00 00 00 00 34 64
C430: 00 00 04 00 00 04 00 00 38
C438: 04 00 00 14 00 00 3C 00 8C
C440: 00 00 00 00 00 00 08 00 48
C448: 00 08 00 00 00 00 00 04 54
C450: 00 00 37 00 00 05 00 00 8C
C458: 11 00 00 13 00 00 30 00 AC
C460: 00 00 00 08 00 00 08 00 70
C468: 00 00 00 00 04 00 00 37 A3
C470: 00 00 04 00 00 11 00 00 85
C478: 31 00 00 03 00 1E 1E 60 49
C480: D1 1E 1E 60 D1 8F 18 D2 3B
C488: D1 C3 D2 18 D1 8F 8F DA D4
C490: 68 8F D2 18 DA 8F 8F 18 85
C498: C3 D1 18 68 68 D1 68 D2 24
C4A0: D1 C3 68 18 C3 D2 68 8F 45
C4A8: D2 18 60 D1 C3 D2 D1 1E 4C
C4B0: D2 C3 1F 18 C3 D2 D1 68 4F
C4B8: DA 8F D2 8F 8F 19 19 16 5D
C4C0: 12 19 19 16 12 0C 0E 0F 56
C4C8: 12 10 0F 0E 12 0C 0C 0B 3D
C4D0: 09 0C 0F 0E 0B 0A 0C 0E 32
C4D8: 11 12 0E 09 09 12 09 0F 46
C4E0: 12 10 09 0E 10 0F 09 0C 4E
C4E8: 0F 0E 16 12 10 0F 12 19 78
C4F0: 0F 10 15 0E 10 0F 12 09 6D
C4F8: 0B 0C 0F 0C 0C 47 47 68 2E
C500: 68 47 47 68 68 47 47 47 9D
C508: 47 0C 0C 68 68 47 47 68 2F
C510: 68 47 47 E9 E9 47 47 0C 75
C518: 0C 68 68 68 68 47 47 47 9B
C520: 47 68 68 68 68 47 47 47 DE
C528: 47 68 68 68 68 47 47 47 E6
C530: 47 61 61 0C 0C 47 47 68 49
C538: 68 47 47 47 47 06 06 09 D2
C540: 09 06 06 09 09 06 06 06 79
C548: 06 07 07 09 09 06 06 09 83
C550: 09 06 06 07 07 05 05 07 84
C558: 07 09 09 09 09 06 06 06 95
C560: 06 09 09 09 09 06 06 05 9B
C568: 05 09 09 09 09 06 06 06 A3
C570: 06 08 08 07 07 06 06 09 A9
C578: 09 06 06 06 06 AD 0E DC 32
C580: 29 FE 8D 0E DC A5 01 29 F0
C588: FB 85 01 A2 00 BD 00 D0 3C
C590: 9D 00 30 E8 E0 00 D0 F5 EE
C598: EE 8F C5 EE 92 C5 AD 92 64
C5A0: C5 C9 37 D0 E6 A9 30 8D 86
C5A8: 92 C5 A9 D0 8D 8F C5 A5 04
C5B0: 01 09 04 85 01 AD 0E DC DD
C5B8: 09 01 8D 0E DC A2 00 BD 9B
C5C0: CB C5 9D 00 34 E8 E0 D8 C6
C5C8: D0 F5 60 AA AA AA AA AA 45
C5D0: AA AA AA 69 99 A5 A5 9D BC
C5D8: 9D 7D 7D 01 01 06 06 1A 99
C5E0: 1A 66 69 FD FD FD FD FD C0
C5E8: FD FD FD FD FD F4 F4 D0 99
C5F0: D0 40 40 40 40 90 90 A4 88
C5F8: A4 99 69 69 66 5A 5A 76 9B
C600: 76 7D 7D 7F 7F 7F 7F 7F EE
C608: 7F 7F 7F 7D 7D 1D 1D 05 C0
C610: 05 01 01 FF FF FF FF FF 17
C618: FF FF FF 55 6A 6A 6A 6A 17
C620: 6A 6A 6A 55 A9 A9 A9 A9 5B
C628: A9 A9 A9 FD FD F6 F6 DA E9
C630: DA 66 69 55 AA AA AA AA DA
C638: AA AA AA 55 AA AA AA AA 38
C640: AA AA 55 AA AA AA AA A9 3F
C648: A6 9A 6A 69 66 DA DA F6 70
C650: F6 FD FD 69 99 A7 A7 9F 35
C658: 9F 7F 7F FD FD F6 F6 DA BB
C660: DA 6A 6A 7F 7F 9F 9F A7 F5
C668: A7 A9 A9 6A 6A 9A 9A A6 14
C670: A6 A9 A9 FD FD 3D 3D 0D ED
C678: 0D 01 01 FF FF 55 F7 F7 CC
C680: F7 55 FF DF DF 55 FF FF E2
C688: FF 55 DF 00 08 80 3E BC 41
C690: 02 20 00 00 20 02 BC 3E CF
C698: 80 08 00 00 00 00 00 00 21
C6A0: 00 00 00 A9 9E 20 D2 FF DB
C6A8: A9 93 20 D2 FF A2 00 BD 39
C6B0: A9 C0 9D C5 05 BD B5 C0 B7
C6B8: 9D 65 06 E8 E0 0C D0 EF 58
C6C0: A9 02 8D 1A 06 A9 19 8D 6A
C6C8: 1B 06 A0 00 20 39 C0 C8 6D
C6D0: C0 19 D0 F8 60 20 A3 C6 5F
C6D8: A9 81 20 D2 FF A9 93 20 54
C6E0: D2 FF A2 00 A9 A0 9D 00 3E
C6E8: 04 9D 00 05 9D 00 06 9D D0
```

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C6F0: E8 06 E8 E0 00 D0 EF A2 0D
C6F8: 00 A9 03 9D A8 D8 9D D8 3B
C700: DA E8 E0 17 D0 F5 A2 00 25
C708: A9 03 9D D0 D8 9D E6 D8 59
C710: 9D 98 D9 9D AE D9 9D 10 F3
C718: DA 9D 26 DA 18 8A 69 28 C5
C720: AA E0 C8 D0 E3 A2 00 A9 75
C728: 0E 9D D1 D8 9D F9 D8 9D 8C
C730: 21 D9 9D 49 D9 9D 71 D9 D4
C738: 9D 99 D9 9D C1 D9 9D E9 0A
C740: D9 9D 11 DA 9D 39 DA 9D F2
C748: 61 DA 9D 89 DA 9D B1 DA B0
C750: E8 E0 15 D0 D4 A2 00 A9 21
C758: 20 9D 00 60 E8 E0 00 D0 11
C760: F6 EE 5B C7 AD 5B C7 C9 04
C768: 80 D0 EA A9 60 8D 5B C7 5F
C770: A2 00 A0 96 98 9D 7A 63 5E
C778: 9D 12 77 C8 C0 98 D0 02 94
C780: A0 96 E8 E0 44 D0 ED A9 2E
C788: 00 8D 8E C9 A0 96 98 8D CB
C790: 7A 63 8D BD 63 C8 C0 98 3F
C798: D0 02 A0 96 18 AD 90 C7 C0
C7A0: 69 58 8D 90 C7 B0 03 4C 48
C7A8: AD C7 EE 91 C7 18 AD 93 BF
C7B0: C7 69 58 8D 93 C7 B0 03 D6
C7B8: 4C BE C7 EE 94 C7 EE 8E 54
C7C0: C9 AD 8E C9 C9 39 D0 C6 2B
C7C8: A9 63 8D 91 C7 8D 94 C7 A6
C7D0: A9 7A 8D 90 C7 A9 BD 8D CF
C7D8: 93 C7 A9 00 8D 8E C9 8D 51
C7E0: 8F C9 8D 90 C9 8D 91 C9 0B
C7E8: AE 8E C9 BD B6 C9 8D 0B C6
C7F0: C8 18 BD 92 C9 6D 8F C9 B2
C7F8: 8D 0A C8 B0 03 4C 03 C8 25
C800: EE 0B C8 AE 90 C9 BD DA 64
C808: C9 8D 00 60 18 AD 0A C8 58
C810: 69 58 8D 0A C8 B0 03 4C 32
C818: 1D C8 EE 0B C8 EE 90 C9 0A
C820: EE 91 C9 AD 91 C9 C9 08 45
C828: D0 D9 A9 00 8D 91 C9 EE 54
C830: 8F C9 AD 8F C9 C9 0A D0 35
C838: AF A9 00 8D 8F C9 8D 90 96
C840: C9 8D 91 C9 EE 8E C9 AD E7
C848: 8E C9 C9 24 D0 9A A9 00 A3
C850: 8D 8E C9 AE 8E C9 BD 92 8D
C858: C9 8D 68 C8 BD B6 C9 8D AC
C860: 69 C8 A2 00 BD 2A CA 9D 85
C868: 00 60 E8 E0 0A D0 F5 EE 52
C870: 8E C9 AD 8E C9 C9 06 D0 6F
C878: DA A9 00 8D 8E C9 A2 00 85
C880: AC 8E C9 B9 34 CA 9D 5E 3A
C888: 75 B9 3E CA 9D B6 75 EE 79
C890: 8E C9 AD 8E C9 C9 0A D0 93
C898: 05 A9 00 8D 8E C9 E8 E0 F6
C8A0: 3C D0 DD A9 00 8D 8E C9 1B
C8A8: AE 8E C9 BD 44 C9 8D BD C6
C8B0: C8 BD 67 C9 8D BE C8 A2 20
C8B8: 00 BD 8A C9 9D 00 60 E8 B1
C8C0: E0 04 D0 F5 EE 8E C9 AD 61
C8C8: 8E C9 C9 0F D0 DA 8D 8E C1
C8D0: C9 AE 8E C9 BD 44 C9 8D FA
C8D8: E5 C8 BD 67 C9 8D E6 C8 B3
C8E0: A2 00 A9 9A 9D 00 60 E8 AE
C8E8: E0 02 D0 F8 EE 8E C9 AD 8A
C8F0: 8E C9 C9 23 D0 DB A9 00 8C
C8F8: 8D 8E C9 8D 8F C9 AE 8E 03
C900: C9 BD 3E C9 8D 17 C9 18 16
C908: BD 38 C9 6D 8F C9 8D 16 32
C910: C9 A2 00 A9 98 8D 00 60 AC
C918: 18 AD 8F C9 69 0A 8D 8F C7
C920: C9 AD 8F C9 C9 3C D0 D6 9E
C928: A9 00 8D 8F C9 EE 8E C9 FF
C930: AD 8E C9 C9 06 D0 C7 60 FE
C938: 42 02 C2 82 42 02 66 69 D5
C940: 6B 6E 71 74 46 50 64 6E 69
C948: 10 1A C6 EE 90 AE 46 50 FD
C950: 64 06 24 FA 18 22 2C BA FA
C958: C4 CE D8 E2 7A 98 3A 4E 43
C960: 58 62 6C 04 0E 22 2C 66 4E
C968: 66 66 66 69 69 6B 6B 6E B3
C970: 6E 71 71 71 74 74 67 68 EB
C978: 68 68 6A 6A 6A 6A 6A 6D CA
C980: 6D 70 70 70 70 70 73 73 07
C988: 73 73 9A 8E 8E 9A 00 00 C1
C990: 00 00 DE E8 F2 FC 06 10 5E
C998: 9E A8 B2 BC C6 D0 5E 68 AD
C9A0: 72 7C 86 90 1E 28 32 3C 5B
C9A8: 46 50 DE E8 F2 FC 06 10 0D
C9B0: 9E A8 B2 BC C6 D0 64 64 C7
C9B8: 64 64 65 65 67 67 67 67 E9
C9C0: 67 67 6A 6A 6A 6A 6A 6A 0E
C9C8: 6D 6D 6D 6D 6D 6D 6F 6F 38
C9D0: 6F 6F 70 70 72 72 72 72 5A
C9D8: 72 72 20 20 82 8D 8D 8D 29
C9E0: 86 88 88 82 80 81 84 85 07
C9E8: 80 86 8E 80 81 84 20 20 45
C9F0: 85 80 8D 81 84 20 20 20 EA
C9F8: 20 85 8E 83 20 20 20 20 31
CA00: 20 20 8E 83 20 20 20 20 D2
CA08: 20 20 8D 86 88 20 20 20 45
CA10: 20 82 8E 80 86 88 20 20 11
CA18: 82 80 84 85 80 86 88 82 37
CA20: 80 81 20 20 85 8D 8D 8D 90
CA28: 81 84 20 20 82 8D 8E 8E 9B
CA30: 8D 85 20 20 20 88 86 8D 40
CA38: 8E 8E 8D 81 84 20 20 20 49
CA40: 88 83 83 83 83 84 20 20 9B
CA48: FF 48
```

All the programs in this issue are available on disk. **See page 37 for ordering information.**

NO NEWS
FROM PAGE 30

C-64 VERSION

```
•10 REM *** NO NEWS (64) *** BUCK CHILDRE
 SS ***                                      CA
•20 REM *** P.O. BOX 13575 SALEM, OR 9730
 9 ***                                       OA
•30 PRINTCHR$(147)"LOADING AND CHECKING D
 ATA LINE:":J=53000                          BN
•40 FORB=0TO11:READA                         MB
•50 IFB=0THENL=PEEK(64)*256+PEEK(63):PRIN
 TCHR$(19)TAB(31)L:PRINT                     PF
•60 IFA<0ORA>255THEN80                       FK
•70 POKEJ+B,A:X=X+A:D=D+1:NEXTB:READA:IFA
 =XTHEN90                                    PL
•80 PRINT"ERROR IN DATA LINE:"L:END          MG
•90 X=0:J=J+12:IFD<240THEN40                 HP
•100 PRINT"THE DATA IS OK[3"."]":PRINT       FB
•110 PRINT"SYS 53[3"0"] TOGGLES ON AND OF
 F[3"."]":END                                OD
•120 DATA169,79,32,210,255,160,207,204,3,
 3,240,19,1581                               BA
•130 DATA173,2,3,174,3,3,141,251,207,142,
 252,207,1558                                JA
•140 DATA169,78,162,59,76,50,207,169,70,3
 2,210,255,1537                              DG
•150 DATA174,251,207,172,252,207,142,2,3,
 140,3,3,1556                                LA
•160 DATA76,210,255,32,96,165,134,122,132
 ,123,32,115,1492                            NK
•170 DATA0,170,240,243,162,255,134,58,176
 ,3,76,156,1673                              IO
•180 DATA164,32,121,165,169,1,141,249,207
 ,169,0,160,1578                             LN
•190 DATA255,141,248,207,141,250,207,141,
 246,207,200,185,2428                        PJ
•200 DATA0,2,240,107,201,34,208,6,77,246,
 207,76,1404                                 LP
•210 DATA99,207,174,246,207,208,235,201,1
 38,240,8,201,2164                           NC
•220 DATA147,240,4,201,162,208,223,165,21
 4,141,247,207,2159                          NJ
•230 DATA174,247,207,160,0,24,32,240,255,
 169,224,160,1892                            PO
•240 DATA207,32,30,171,238,248,207,208,28
 ,206,249,207,2031                           LF
•250 DATA208,23,169,20,141,249,207,169,12
 8,77,250,207,1848                           HO
•260 DATA141,250,207,240,215,169,18,32,21
 0,255,76,140,1953                           EJ
•270 DATA207,32,228,255,201,78,240,4,201,
 89,208,212,1955                             JO
•280 DATA32,210,255,201,78,208,3,76,116,1
 64,169,13,1525                              JL
•290 DATA32,210,255,76,225,167,65,46,72,4
 6,83,46,1323                                ME
•300 DATA65,82,69,32,89,79,85,32,83,85,82
 ,69,852                                     CD
•310 DATA63,32,40,89,47,78,41,146,32,0,0,
 0,568                                       ED
```

C-128 VERSION

```
•10 REM *** NO NEWS (128) *** BUCK CHILDR
 ESS ***                                     HJ
•20 REM *** P.O. BOX 13575 SALEM, OR 9730
 9 ***                                       OA
•30 PRINTCHR$(147)"LOADING AND CHECKING D
 ATA LINE:":J=3072                           BP
•40 FORB=0TO11:READA                         MB
•50 IFB=0THENL=PEEK(66)*256+PEEK(65):PRIN
 TCHR$(19)TAB(31)L:PRINT                     LB
•60 IFA<0ORA>255THEN80                       FK
•70 POKEJ+B,A:X=X+A:D=D+1:NEXTB:READA:IFA
 =XTHEN90                                    PL
•80 PRINT"ERROR IN DATA LINE:"L:END          MG
•90 X=0:J=J+12:IFD<264THEN40                 MB
•100 PRINT"THE DATA IS OK[3"."]":PRINT       FB
•110 PRINT"SYS 3072 TOGGLES ON AND OFF[3"
 ."]":END                                    HN
•120 DATA169,0,141,0,255,169,79,32,210,25
 5,160,12,1482                               HI
•130 DATA204,3,3,240,19,173,2,3,174,3,3,1
 41,968                                      GJ
•140 DATA12,13,142,13,13,169,78,162,56,76
 ,47,12,793                                  BD
•150 DATA169,70,32,210,255,174,12,13,172,
 13,13,142,1275                              GM
•160 DATA2,3,140,3,3,76,210,255,162,255,1
 34,60,1303                                  AG
•170 DATA32,147,79,134,61,132,62,32,128,3
 ,170,240,1220                               AN
•180 DATA239,176,3,76,226,77,32,10,67,169
 ,1,141,1217                                 HB
•190 DATA10,13,169,0,160,255,141,9,13,141
 ,11,13,935                                  HO
•200 DATA141,6,13,141,7,13,200,185,0,2,20
 8,3,919                                     NJ
•210 DATA76,220,77,201,34,208,6,77,6,13,7
 6,96,1090                                   OI
•220 DATA12,174,6,13,208,232,201,138,240,
 31,201,147,1603                             BM
•230 DATA240,27,201,162,240,23,201,240,24
 0,19,201,254,2048                           NM
•240 DATA240,209,201,17,240,4,201,27,208,
 201,173,7,1728                              DL
•250 DATA13,201,254,208,197,165,235,141,8
 ,13,174,8,1617                              HE
•260 DATA13,160,0,24,32,240,255,32,129,14
 6,65,82,1178                                KE
```

```
·270 DATA69,32,89,79,85,32,83,85,82,69,63
,32,800                                      MJ
·280 DATA40,89,47,78,41,146,32,0,238,9,13
,208,941                                     GO
·290 DATA28,206,10,13,208,23,169,20,141,1
0,13,169,1010                                KN
·300 DATA128,77,11,13,141,11,13,240,197,1
69,18,32,1050                                EM
·310 DATA210,255,76,166,12,32,228,255,201
,78,240,4,1757                               EG
·320 DATA201,89,208,212,32,210,255,201,78
,208,3,76,1773                               NI
·330 DATA55,77,169,13,32,210,255,76,220,7
7,0,0,1184                                   NO
```

RED ALERT
FROM PAGE 60

Starting address in hex: C000
Ending address in hex: C865
SYS to start: 49152

***Flankspeed* required for entry! See page 79.**

```
C000: A9 08 20 D2 FF 20 1E C5 A8
C008: A9 93 20 D2 FF A0 00 98 71
C010: 99 40 71 C8 C0 C0 90 F8 2F
C018: A9 08 8D 5C 71 8D 62 71 86
C020: A9 22 8D 5F 71 A9 18 8D 99
C028: 9F 71 A9 3C 8D DF 71 A0 9E
C030: 00 B9 66 C7 99 00 72 C8 EC
C038: D0 F7 A0 18 B9 2C C6 99 FF
C040: 00 D4 88 10 F7 A9 00 8D DC
C048: 20 D0 8D 21 D0 8D 15 D0 2C
C050: 8D 1C D0 A9 C5 8D F8 77 38
C058: A9 FF 8D 17 D0 8D 1B D0 F0
C060: 8D 1D D0 A9 F7 8D 48 77 CA
C068: 8D 49 77 8D 6E 77 8D 6F 27
C070: 77 A9 08 8D 48 DB 8D 49 22
C078: DB 8D 6E DB 8D 6F DB A0 A5
C080: 27 A9 A0 99 70 77 A9 EF 0D
C088: 99 98 77 A9 08 99 70 DB C9
C090: 99 98 DB 88 10 EB A2 14 D9
C098: A0 13 18 20 F0 FF A9 F6 16
C0A0: A0 C6 20 1E AB A2 18 A0 4D
C0A8: 02 18 20 F0 FF A9 0B A0 29
C0B0: C7 20 1E AB 20 68 C4 A9 59
C0B8: 01 8D 83 C5 20 3B C4 A2 53
C0C0: 05 A9 00 9D 87 C5 CA 10 35
C0C8: FA 8D 86 C5 20 B8 C4 A9 E4
C0D0: 9F 8D 81 C5 A9 8C 8D 80 89
C0D8: C5 A9 00 8D 82 C5 85 05 A8
C0E0: A0 5A 99 8D C5 88 10 FA 5C
C0E8: 20 E3 C3 A2 30 AD 83 C5 7A
C0F0: C9 0A 90 06 E9 0A E8 4C 84
C0F8: F0 C0 8E D6 77 09 30 8D 4E
C100: D7 77 AD C9 77 8D 85 C5 17
C108: AD 1B D4 29 07 09 10 8D 7C
C110: 84 C5 A0 43 8C 33 77 C8 3E
C118: 8C 34 77 A9 FF 8D 15 D0 6D
C120: A0 04 A2 10 8E 04 D4 E8 C7
C128: 8E 04 D4 A2 0F 8A 09 20 F4
C130: 8D 01 D4 A9 02 20 89 C4 AD
C138: EE 27 D0 CA 10 EF 88 D0 43
C140: E1 8C 00 D4 A9 05 8D 01 C0
C148: D4 AD 8D 02 D0 FB E6 04 12
C150: A5 04 29 3F D0 03 EE 27 4C
C158: D0 29 0F D0 03 20 EA C1 02
C160: 20 2B C2 20 91 C4 A5 05 8F
C168: F0 05 C6 05 4C 7B C1 38 EB
C170: A9 18 ED 83 C5 0A 85 05 FD
C178: 20 F3 C2 20 E3 C3 AD 84 49
C180: C5 D0 C6 A2 06 BD B0 C5 BA
C188: D0 BF CA 10 F8 A9 28 20 DE
C190: 89 C4 AC 83 C5 C8 C0 15 73
C198: B0 03 8C 83 C5 A2 00 8E 53
C1A0: 15 D0 86 02 BD 87 C5 D0 EA
C1A8: 24 BC F0 C5 A9 45 99 48 11
C1B0: 77 99 49 77 8A 48 A2 0A 02
C1B8: 20 23 C4 A2 80 8E 0B D4 52
C1C0: E8 8E 0B D4 A9 14 20 89 7F
C1C8: C4 68 AA E6 02 E8 E0 06 59
C1D0: 90 D2 AD C9 77 CD 85 C5 3C
C1D8: F0 03 EE 86 C5 A5 02 0D BC
C1E0: 86 C5 F0 03 4C CC C0 4C 47
C1E8: B4 C0 AD 00 DC AA 29 03 BF
C1F0: A8 18 AD 80 C5 79 E8 C5 CD
C1F8: C9 32 90 07 C9 B4 B0 03 BE
C200: 8D 80 C5 8A 29 0C 4A 4A 28
C208: A8 18 AD 81 C5 79 E8 C5 E5
C210: AA AD 82 C5 79 EC C5 D0 AD
C218: 07 E0 18 90 0D 4C 24 C2 E8
C220: E0 29 B0 06 8E 81 C5 8D 44
C228: 82 C5 60 AD DA C5 D0 47 37
C230: AD 8D C5 D0 58 AD 33 77 B2
C238: C9 20 F0 07 AD 00 DC 29 CD
C240: 10 F0 01 60 A9 A0 8D 9B 16
C248: C5 A9 C4 8D B0 C5 A9 C6 F0
C250: 8D F9 77 A9 00 8D A2 C5 EE
C258: 8D 94 C5 8D A9 C5 A9 01 E7
C260: 8D 28 D0 AD 80 C5 85 FB 5C
C268: AD 81 C5 85 FC AD 82 C5 D5
C270: 85 FD A2 00 20 8E C3 A2 AB
C278: 00 20 B3 C3 EE DA C5 D0 70
C280: 71 EE 8D C5 A2 80 8E 04 E9
C288: D4 E8 8E 04 D4 A2 06 BD 14
C290: 8D C5 D0 5B 38 AD B0 C5 6C
C298: E9 09 DD B0 C5 B0 50 18 F8
C2A0: 69 13 DD B0 C5 90 48 38 82
C2A8: AD 9B C5 E9 09 85 02 AD DF
C2B0: A2 C5 E9 00 85 03 38 A5 69
C2B8: 02 FD 9B C5 A5 03 FD A2 63
C2C0: C5 B0 2C 18 A5 02 69 13 9F
C2C8: 85 02 A5 03 69 00 85 03 EA
C2D0: 38 A5 02 FD 9B C5 A5 03 B8
C2D8: FD A2 C5 90 12 FE 8D C5 34
C2E0: A9 00 9D DA C5 8A 48 AE 4A
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C2E8: 83 C5 20 23 C4 68 AA CA 18
C2F0: D0 9D 60 A2 06 BD DA C5 C6
C2F8: D0 56 BD 8D C5 D0 05 AD B4
C300: 84 C5 D0 03 4C 87 C3 CE 84
C308: 84 C5 AD 1B D4 29 1F 09 41
C310: 08 9D B0 C5 9D 28 D0 A0 63
C318: 00 AD 1B D4 C9 20 B0 01 51
C320: C8 9D 9B C5 98 9D A2 C5 86
C328: A9 C7 9D F9 77 A9 00 9D EF
C330: 94 C5 9D A9 C5 AD 1B D4 35
C338: 29 07 9D E1 C5 A8 B9 04 14
C340: C6 85 FC B9 0C C6 85 FD 99
C348: B9 14 C6 85 FB 20 8E C3 D0
C350: 20 B3 C3 FE DA C5 D0 2F 87
C358: FE 8D C5 A0 80 8C 04 D4 31
C360: C8 8C 04 D4 BC E1 C5 C0 B3
C368: 06 90 0B A9 20 8D 33 77 0C
C370: 8D 34 77 4C 87 C3 A9 01 EB
C378: 99 87 C5 B9 F0 C5 A8 A9 22
C380: 45 99 48 77 99 49 77 CA 44
C388: F0 03 4C F5 C2 60 38 A5 BF
C390: FC FD 9B C5 9D B7 C5 A5 AD
C398: FD FD A2 C5 9D BE C5 9D BC
C3A0: C5 C5 38 A5 FB FD B0 C5 7A
C3A8: 9D CC C5 A9 00 E9 00 9D 0A
C3B0: D3 C5 60 18 BD 94 C5 7D 58
C3B8: B7 C5 9D 94 C5 BD 9B C5 4D
C3C0: 7D BE C5 9D 9B C5 BD A2 22
C3C8: C5 7D C5 C5 9D A2 C5 18 B5
C3D0: BD A9 C5 7D CC C5 9D A9 55
C3D8: C5 BD B0 C5 7D D3 C5 9D 87
C3E0: B0 C5 60 A2 06 8A 0A A8 9D
C3E8: BD B0 C5 99 03 D0 BD 9B E3
C3F0: C5 99 02 D0 AD 10 D0 3D EE
C3F8: FD C5 A8 BD A2 C5 F0 05 81
C400: 98 1D F6 C5 A8 8C 10 D0 88
C408: CA 10 DA AD 80 C5 8D 01 40
C410: D0 AD 81 C5 8D 00 D0 AD E1
C418: 10 D0 29 FE 0D 82 C5 8D 04
C420: 10 D0 60 A0 04 38 B9 C8 C0
C428: 77 69 00 C9 3A 90 02 A9 49
C430: 30 99 C8 77 88 10 EF CA 8D
C438: D0 E9 60 A0 00 B9 C8 77 ED
C440: D9 E0 77 F0 05 B0 0B 4C 70
C448: 5D C4 C8 C0 06 90 EE 4C C5
C450: 5D C4 A0 05 B9 C8 77 99 AB
C458: E0 77 88 10 F7 A0 05 A9 90
C460: 30 99 C8 77 88 10 FA 60 5E
C468: EE 86 02 A9 64 A0 C6 20 75
C470: 1E AB A9 04 20 89 C4 AD 04
C478: 00 DC 29 10 D0 EA A0 BD A8
C480: A9 20 99 2B 74 88 D0 FA D7
C488: 60 18 65 A2 C5 A2 D0 FC 3F
C490: 60 A2 06 BD 8D C5 F0 1C B7
C498: 4A 4A 4A 4A 4A A8 B9 1C 8A
C4A0: C6 9D 28 D0 B9 24 C6 9D 40
C4A8: F9 77 FE 8D C5 D0 05 A9 EB
C4B0: 00 9D B0 C5 CA 10 DC 60 DC
C4B8: A2 05 86 02 BD 87 C5 F0 E4
C4C0: 0F AD 86 C5 F0 1F CE 86 2F
C4C8: C5 A9 00 85 02 9D 87 C5 AA
C4D0: BC F0 C5 A9 41 99 48 77 88
C4D8: A9 42 99 49 77 A9 06 99 68
C4E0: 48 DB 99 49 DB CA 10 D4 73
C4E8: A5 02 D0 31 8D 04 D4 A5 9E
C4F0: 02 0A 18 65 02 A8 B9 45 24
C4F8: C6 F0 22 A2 10 8E 04 D4 EC
C500: B9 46 C6 F0 0D 8D 01 D4 28
C508: B9 47 C6 8D 00 D4 E8 8E A9
C510: 04 D4 B9 45 C6 20 89 C4 1D
C518: E6 02 4C EF C4 60 AD 0E 1E
C520: DC 29 FE 8D 0E DC A5 01 44
C528: 29 FB 85 01 A9 D0 85 3A 0E
C530: A9 78 85 3C A0 00 84 39 72
C538: 84 3B A2 08 B1 39 91 3B 5A
C540: C8 D0 F9 E6 3A E6 3C CA E2
C548: D0 F2 A5 01 09 04 85 01 46
C550: AD 0E DC 09 01 8D 0E DC 6B
C558: A0 2F B9 36 C7 99 08 7A FB
C560: 88 10 F7 AD 02 DD 09 03 8A
C568: 8D 02 DD AD 00 DD 29 FC 87
C570: 09 02 8D 00 DD A9 DE 8D FC
C578: 18 D0 A9 74 8D 88 02 60 F7
C580: 00 00 00 00 00 00 00 00 80
C588: 00 00 00 00 00 00 00 00 88
C590: 00 00 00 00 00 00 00 00 90
C598: 00 00 00 00 00 00 00 00 98
C5A0: 00 00 00 00 00 00 00 00 A0
C5A8: 00 00 00 00 00 00 00 00 A8
C5B0: 00 00 00 00 00 00 00 00 B0
C5B8: 00 00 00 00 00 00 00 00 B8
C5C0: 00 00 00 00 00 00 00 00 C0
C5C8: 00 00 00 00 00 00 00 00 C8
C5D0: 00 00 00 00 00 00 00 00 D0
C5D8: 00 00 00 00 00 00 00 00 D8
C5E0: 00 00 00 00 00 00 00 00 E0
C5E8: 00 01 FF 00 00 00 FF 00 E9
C5F0: 04 08 0C 1A 1E 22 02 04 69
C5F8: 08 10 20 40 80 FD FB F7 E3
C600: EF DF BF 7F 28 48 68 D8 C0
C608: F8 18 A0 A0 00 00 00 00 5A
C610: 00 01 00 00 CA CA CA CA 3C
C618: CA CA C3 C3 04 06 05 07 4B
C620: 02 08 0A 09 C8 C9 CA CB 66
C628: CA C9 C8 C7 00 00 00 00 4D
C630: 00 1A 09 3E 1E 00 00 00 AF
C638: 10 08 FF FF 00 00 80 00 D0
C640: 00 00 5A F1 AF 0A 28 B6 25
C648: 09 24 59 09 24 59 09 24 82
C650: 59 0A 28 B6 09 24 59 09 22
C658: 24 59 09 24 59 0C 28 B6 47
C660: 20 00 00 00 13 11 20 20 E4
C668: 20 20 B2 C0 C9 20 B2 C0 79
C670: AE 20 B2 C0 C9 20 20 D5 92
C678: C0 C9 20 B2 20 20 20 B2 E8
C680: C0 AE 20 B2 C0 C9 20 B0 1E
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C688: B2 AE 0D 20 20 20 20 AB 23
C690: C0 C6 20 AB B3 20 20 DD B5
C698: 20 DD 20 20 AB C0 B3 20 17
C6A0: DD 20 20 20 AB B3 20 20 7E
C6A8: AB C0 C6 20 20 DD 0D 20 27
C6B0: 20 20 20 B1 20 B1 20 B1 66
C6B8: C0 BD 20 B1 C0 CB 20 20 D5
C6C0: B1 20 B1 20 B1 C0 BD 20 B4
C6C8: B1 C0 BD 20 B1 20 B1 20 BC
C6D0: 20 B1 0D 0D 20 20 20 20 3D
C6D8: 20 20 20 50 52 45 53 53 C7
C6E0: 20 46 49 52 45 20 42 55 DF
C6E8: 54 54 4F 4E 20 54 4F 20 13
C6F0: 53 54 41 52 54 00 9E C3 E2
C6F8: C4 11 9D 9D 9D 9D 9D 81 64
C700: AF A2 12 B7 20 20 B7 92 A6
C708: A2 AF 00 9A 53 43 4F 52 2D
C710: 45 20 05 30 30 30 30 30 6B
C718: 30 20 20 20 9C 57 41 56 34
C720: 45 20 05 30 31 20 20 20 4C
C728: 1E 48 49 47 48 20 05 30 BC
C730: 30 30 30 30 30 00 01 13 35
C738: 37 37 7F 7F FF 00 00 00 A5
C740: 30 F8 FE FE FF 00 00 00 67
C748: 00 00 00 03 03 00 00 00 4E
C750: 00 00 00 C0 C0 00 00 00 D1
C758: 00 00 00 00 FF 00 18 18 88
C760: 30 E0 E0 30 18 18 00 00 B2
C768: 00 00 00 00 00 00 00 00 68
C770: 00 00 00 00 00 00 00 00 70
C778: 00 08 00 00 00 00 00 A1 22
C780: 00 00 08 00 01 3C 80 00 46
C788: 10 00 00 85 00 00 10 00 2E
C790: 00 00 00 00 00 00 00 00 90
C798: 00 00 00 00 00 00 00 00 98
C7A0: 00 00 00 00 00 00 00 00 A0
C7A8: 00 00 00 00 00 00 00 00 A8
C7B0: 00 00 00 04 00 00 00 00 B4
C7B8: 01 00 40 00 32 00 02 10 3E
C7C0: 20 00 2E 00 08 75 08 02 96
C7C8: 8C 20 00 63 00 01 10 40 2A
C7D0: 00 00 00 00 04 00 00 00 D4
C7D8: 00 00 00 00 00 00 00 00 D8
C7E0: 00 00 00 00 00 00 00 00 E0
C7E8: 00 00 00 00 00 00 00 00 E8
C7F0: 04 00 00 00 00 02 00 20 17
C7F8: 00 63 00 04 32 10 00 4F F1
C800: 00 10 D6 84 01 7F 60 00 4C
C808: 5D 00 05 1A 10 00 C1 80 D6
C810: 02 00 20 00 00 00 00 04 36
C818: 00 00 00 00 00 00 00 00 18
C820: 00 00 00 00 00 00 00 00 20
C828: 00 00 00 00 00 42 00 00 6A
C830: 08 00 08 00 10 01 91 80 63
C838: 10 A6 08 01 52 80 43 35 43
C840: C2 0C DE A4 83 3F 00 04 59
C848: FD B0 4B 6E 02 01 5A A0 AE
C850: 10 21 08 01 00 80 08 08 1B
C858: 10 00 00 00 00 42 00 00 AA
C860: 00 00 00 00 00 00 60
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CHAINMAIL!
FROM PAGE 70

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·10 FAST:COLOR.,1:COLOR4,12:COLOR1,12:GRA
 PHIC2,1,.:SLOW:PRINTCHR$(11)CHR$(142);   ON
·20 PRINT"[CLEAR][DOWN][BLUE][c A][3"[s C
 ]"][c S][c A][c S] [c A][c S][c A][s C][
 s C][c S][c A][c S][c A][c S][3" "][c A]
 [c S][c A][c S][c A][c S][c A][s C][s C]
 [c S][c A][c S][c A][c S]  [c A][c S]"   HD
·30 PRINT"[s B][c A][s C][s C][c X][s B][
 s B] [3"[s B]"][c A][c S][4"[s B]"][c Z]
 [s C][s C][c S][s B][c Z][c X][c Z][c X]
 [s B][s B][c A][c S][5"[s B]"]  [s B][s
 B]"                                       EN
·40 PRINT"[s B][s B][3" "][s B][c Z][s C]
 [c X][s B][s B][c Z][c X][4"[s B]"][c A]
 [s C][c S][s B][s B][c A][c S][c A][c S]
 [s B][s B][c Z][c X][5"[s B]"]  [s B][s
 B]"                                       JN
·50 PRINT"[s B][s B][3" "][s B][c A][s C]
 [c S][s B][s B][c A][c S][5"[s B]"] [4"[
 s B]"][c Z][c X][3"[s B]"][c A][c S][5"[
 s B]"]  [s B][s B]"                       HM
·60 PRINT"[s B][s B][3" "][s B][s B] [10"
 [s B]"] [4"[s B]"]  [10"[s B]"]  [c Z][c
  X]"                                      GH
·70 PRINT"[s B][c Z][s C][s C][c S][s B][
 s B] [10"[s B]"] [4"[s B]"]  [9"[s B]"][
 c Z][s C][c S][c A][c S]"                 IO
·80 PRINT"[c Z][3"[s C]"][c X][c Z][c X]
 [c Z][c X][c Z][c X][c Z][c X][c Z][c X]
 [c Z][c X] [c Z][c X][c Z][c X]  [c Z][c
  X][c Z][c X][c Z][c X][c Z][c X][c Z][s
  C][s C][c X][c Z][c X]"                  OA
·90 PRINT"  [c 8][RVSON][sEP][c *][RVSOFF
 ]"SPC(31)"[RVSON][sEP][c *]"              AO
·100 PRINT"  [RVSON][c M] [RVSOFF][3" "][
 YELLOW]BY CLEVELAND M. BLAKEMORE[3" "][c
  8][RVSON][c M] "                         EA
·110 PRINT"  [RVSON][c M][SS][RVSOFF]"SPC
 (31)"[RVSON][c M] "                       NI
·120 PRINT"  [RVSON][c M][SS][RVSOFF]"SPC
 (11)"[RED][3" "]1987"SPC(13)"[c 8][RVSON
 ][c M] "                                  AK
·130 PRINT"  [RVSON][c M][SS][RVSOFF]  [Y
 ELLOW][s U][25"[s C]"][s I]  [c 8][RVSON
 ][c M] "                                  IL
```

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·140 PRINT"  [RVSON][c M][SS][RVSOFF]  [Y
ELLOW][s B][RED][s U][23"[s C]"][s I][YE
LLOW][s B]  [c 8][RVSON][c M] "          NC
·150 PRINT"  [RVSON][c M][SS][RVSOFF]  [Y
ELLOW][s B][RED][s B][c 3][RVSON] A TWO
PLAYER GAME FOR [RED][RVSOFF][s B][YELLO
W][s B]  [c 8][RVSON][c M] "             KM
·160 PRINT"  [RVSON][c M][SS][RVSOFF]  [Y
ELLOW][s B][RED][s B][c 3][RVSON][6" "]T
HE C-128[8" "][RED][RVSOFF][s B][YELLOW]
[s B]  [c 8][RVSON][c M] "               NB
·170 PRINT"  [RVSON][c M] [RVSOFF]  [YELL
OW][s B][RED][s B]"SPC(23)"[s B][YELLOW]
[s B]  [c 8][RVSON][c M] "               OG
·180 PRINT"  [RVSON][c M] [RVSOFF]  [YELL
OW][s B][RED][s B] [c 3]LEFT=ROTATE CW
 (1-8) [RED][s B][YELLOW][s B]  [c 8][RVS
ON][c M] "                               JC
·190 PRINT" [c 5][s U][s C][s C][s I] [YE
LLOW][s B][RED][s B][c 3]RIGHT=ROTATE CC
W (1-8) [RED][s B][YELLOW][s B] [c 5][s
U][s C][s C][s I]"                       JI
·200 PRINT"  [c 4][RVSON][c F][c D][RVSOF
F]  [YELLOW][s B][RED][s B] [c 3]FIRE=SW
ING SWORD[6" "][RED][s B][YELLOW][s B]
[c 4][RVSON][c F][c D]"                  OH
·210 PRINT"  [RVSON][c V][c C][RVSOFF]  [
YELLOW][s B][RED][s B][c 3]F/DIR=MOVE IN
 CUR DIR  [RED][s B][YELLOW][s B]  [c 4]
[RVSON][c V][c C]"                       FM
·220 PRINT"  [c 2][RVSON][cEP][cEP][RVSOF
F]  [YELLOW][s B][RED][s B][RED][RVSON]
RED [RVSOFF][BACKARROW]PORT1 [GREEN][RVS
ON]GREEN[RVSOFF][BACKARROW]PORT2[RED][s
B][YELLOW][s B]  [c 2][RVSON][cEP][cEP]" BL
·230 PRINT"  [RVSON][cEP][cEP][RVSOFF]  [
YELLOW][s B][RED][s J][23"[s C]"][s K][Y
ELLOW][s B]  [c 2][RVSON][cEP][cEP]"     FH
·240 PRINT"  [RVSON][c P][c P][RVSOFF]  [
YELLOW][s J][25"[s C]"][s K]  [c 2][RVSO
N][c P][c P]"                            GM
·250 PRINTTAB(10)"[BLUE]LOADING SPRITE DA
TA";:A=4864:B=6079:FORC=ATOB:READD:POKEC
,D:NEXT:A=3584:B=3711:FORC=ATOB:READD:PO
KEC,D:NEXT                               MD
·260 A=3712:B=3712+63:FORC=ATOB:POKEC,.:N
EXT:A=3712+8*3:B=3712+8*3*2:FORC=ATOB-1:
POKEC,255:NEXT                           BJ
·270 PRINTCHR$(145)CHR$(13)CHR$(27)"Q"TAB
(9)"LOADING INTERRUPT DATA";:A=3072:B=34
56:FORC=ATOB:READD:POKEC,D:NEXT          IJ
·280 POKE4590,30:POKE4591,30:POKE4592,60:
POKE4593,190                             EA
·290 PRINTCHR$(145)CHR$(13)CHR$(27)"Q"TAB
(9)"CREATING DUNGEON ARENA";:SPRSAV1,A$:
FORC=.TO320STEP24:GSHAPEA$,C,.,1:NEXT    NF
·300 FORC=21TO158STEP21:GSHAPEA$,.,C,1:GS
HAPEA$,296,C,1:NEXT:FORC=.TO320STEP24:GS
HAPEA$,C,168,1:NEXT:COLOR1,3:CHAR1,7,24,
"[6" "]",1:COLOR1,6                      LD
·310 CHAR1,27,24,"[6" "]",1:GRAPHIC.     BK
·320 CLR:DIM J,A,R(2),S(2),H(2),P,Z,X,D,Y
,B,F,O,T,H,V,LP,RP:P=8183:Y=15:O=1:T=2:H
=3:Z=1:X=8:D=45:B=75:F=5:SC=.:LP=64:RP=1
28:V=4                                   GG
·330 DEFFNA(X)=JANDY:DEFFNR(J)=R(Z)+(A<F)
*-O+(A>F)*O+(R(Z)=XANDA<F)*X+(R(Z)=OAND(
A>F))*-X:DEFFNS(J)=B+R(Z)+S(Z)*X:DEFFNC(
X)=(JANDH)                               EE
·340 DEFFNU(P)=H(P)+(H(P)<D+T)*-T:DEFFNI(
A)=80+(A-O)*160+H(A):DEFFNP(J)=J+V+(J+V>
X)*X:DEFFND(J)=(R(J)-O)*D                EC
·350 TEMPO 18:ENVELOPE 0,0,9,2,1,2,1536:P
LAY"X0U9":PLAY"V1T0V2T0V3T0":VOL15       AJ
·360 A$(1)="V303SEV204IGV1IBIRV303SBSR04S
FV2QDV1QAV3SR03SBSR02SAV104IEIRV303SFSRS
BV104QDV3SR03SFSRV105HCV2HCV304HEV2HBV10
5HEV304QE                                JD
·370 A$(2)="V303SEV104IEIRV303SBSR04SFV1Q
DV3SR03SBSR02SAV204IGV1IBIRV303SFSRSBV20
4QDV1QAV3SR03SFSR                        FE
·380 A$(3)="V303SEV104IEIRV303SBSR04SFV1Q
DV3SR03SBSR02SAV104HEV3SR03SFSRSBSR.IFV2
IR                                       FD
·390 SPRITE1,.,3,.,1,1,.:R(1)=5:MOVSPR1,.
#.:MOVSPR1,163,70:POKE8184,80:SPRITE2,.,
6,.,1,1:MOVSPR2,163,180:POKE8185,76:R(2)
=1                                       IO
·400 SPRCOLOR9,8:POKE8186,93:POKE8187,93:
SPRITE3,.,3,.,.,.,.,1:SPRITE4,.,3,.,.,.,.,1:
MOVSPR3,48,200:MOVSPR4,295,70            HI
·410 POKE8188,58:POKE8189,58:SPRITE5,.,1,
.,1,.:SPRITE6,.,1,.,1,.:MOVSPR5,80+48,23
4:MOVSPR6,240+48,234                     AI
·420 POKE8190,57:POKE8191,57:SPRITE7,.,12
,.,1,1:SPRITE8,.,12,.,1,1:MOVSPR7,100,12
0:MOVSPR8,217,120                        JO
·430 FORA=.TO10:J=BUMP(1):NEXT:SYS3072:PO
KE4594,.:H(1)=48:H(2)=48                 NE
·440 PRINTCHR$(145)CHR$(13)CHR$(27)"Q"TAB
(6)"[c 7]PRESS FIRE BUTTONS TO BEGIN!";  NF
·450 A=1:DO:PLAYA$(A):A=A+O+(A=H)*H:LOOPU
NTILJOY(1)=RPANDJOY(2)=RP:GRAPHIC1,.:POK
E53248+21,255                            LK
·460 REM MAIN LOOP                       LP
·470 DO:Z=H-Z:J=JOY(Z):A=FNA(.):IFAANDA=J
THENR(Z)=FNR(.):SOUNDZ,P,O:ELSEIFA=.ANDA
<>JANDS(Z)=.THENS(Z)=O:SOUNDZ,P,H,,,,H:E
LSES(Z)=.                                FM
·480 POKEP+Z,FNS(.):J=BUMP(O):LOOPUNTILH(
Z)<=.ORFNC(.):ONFNC(.)GOTO530,540,490:GO
TO600                                    OB
·490 IFR(T)<>FNP(R(O))THEN520            EC
·500 IFS(O)ANDS(T)=.THENH(T)=H(T)-T:MOVSP
RF,FNI(T),+.                             AH
·510 IFS(T)ANDS(O)=.THENH(O)=H(O)-T:MOVSP
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 RF+0,FNI(0),+.                                    DG
·520 SOUNDZ,B*B,F,T,B,B*H,H:MOVSPRO,F;FND
 (T):MOVSPRT,F;FND(O):J=BUMP(O):J=BUMP(O)
 :GOTO470                                          GL
·530 A=.:IFJAND(Y-H)THENH(O)=FNU(O):MOVSP
 RF+0,FNI(0),+.:GOTO570                            IO
·540 IFJAND(Y-H)THENH(T)=FNU(T):MOVSPRF,F
 NI(T),+.:GOTO570                                  OE
·550 IFJANDLPTHENA=F+T:GOTO580                     HJ
·560 IFJANDRPTHENA=X:GOTO580                       JO
·570 J=BUMP(O):J=BUMP(O):GOTO470                   HL
·580 POKE4594,0:IFATHENMOVSPRFNC(.),RSPPO
 S(A,.)+12,RSPPOS(A,O)+12:SPRITEFNC(.),,,
 ,.,.                                              IM
·590 Z=FNC(.)                                      LK
·600 POKE4594,0:SOUNDO,20000,150,1,300,10
 0,2:FORD=.TOF:FORA=OTOX:POKEP+Z,B+A:FORJ
 =.TOY:NEXTJ,A,D:POKEP+Z,92:FORJ=OTOF:SOU
 NDO,J*2000,F,,J*B,J*P,H:NEXT                      OI
·610 SLEEP5:POKE53248+21,.:GRAPHIC.:RUN32
 0                                                 DA
·620 DATA0,,128,,1,,,2                             FB
·630 DATA0,,4,,,8,,.                               AM
·640 DATA236,,1,199,,2,146,128                     PC
·650 DATA005,41,64,5,69,64,5,125                   PF
·660 DATA064,3,69,128,22,170,208,41                NG
·670 DATA125,40,32,254,8,39,131,200                KN
·680 DATA024,,48,,,,,.                             IP
·690 DATA0,,,,,,,.                                 LD
·700 DATA0,,,,,,,.                                 MN
·710 DATA0,,,,,252,,25                             KJ
·720 DATA062,,42,64,127,78,252,128                 HG
·730 DATA066,196,192,58,165,64,6,149               GF
·740 DATA064,3,253,64,,98,64,.                     KL
·750 DATA092,128,,63,128,,34,.                     AI
·760 DATA0,19,128,,8,128,,8                        OC
·770 DATA128,,15,,,,,.                             BL
·780 DATA0,,,,224,,1,16                            AD
·790 DATA0,1,32,,,151,,.                           DO
·800 DATA152,128,,175,64,,208,224                  GO
·810 DATA0,110,96,,117,32,,100                     FE
·820 DATA128,,117,48,,110,104,.                    IM
·830 DATA208,196,,175,66,,152,129                  LD
·840 DATA0,151,,1,32,,1,16                         LB
·850 DATA0,,224,,,,,.                              BM
·860 DATA0,15,,,8,128,,8                           MA
·870 DATA128,,19,128,,34,,.                        OO
·880 DATA063,128,,92,128,,98,64                    NM
·890 DATA003,253,64,6,149,64,58,165                EP
·900 DATA064,66,196,192,78,252,128,42              LH
·910 DATA064,,25,62,,,253,.                        HE
·920 DATA0,1,,,1,,,1                               BE
·930 DATA0,,1,,,1,,255                             JA
·940 DATA0,,,,,,,.                                 LK
·950 DATA0,,,,24,,48,39                            MH
·960 DATA131,200,32,254,8,41,125,40                MJ
·970 DATA022,170,208,3,69,128,5,125                GD
·980 DATA064,5,69,64,5,41,64,2                     GO
·990 DATA146,128,1,199,,,236,.                     PD
·1000 DATA0,32,,,64,,,128                          PL
·1010 DATA0,1,,,2,,,.                              FE
·1020 DATA0,240,,,1,16,,1,16                       JC
·1030 DATA0,1,200,,,68,,1                          IC
·1040 DATA252,,1,58,,2,70,.                        CF
·1050 DATA002,191,192,2,169,96,2,165               GO
·1060 DATA092,3,35,66,1,63,114,254                 HC
·1070 DATA002,84,,124,152,,63,.                    FP
·1080 DATA0,,,,,,,.                                EL
·1090 DATA0,,,,,,,255                              MA
·1100 DATA0,1,192,,2,32,,1                         AA
·1110 DATA032,,58,64,32,70,64,16                   HJ
·1120 DATA189,64,8,194,192,5,157,128               EN
·1130 DATA003,43,128,,73,128,1,43                  GC
·1140 DATA128,1,157,128,1,194,192,.                OK
·1150 DATA189,64,,70,64,,58,64                     DF
·1160 DATA0,1,32,,2,32,,1                          AC
·1170 DATA192,,,,,,,255                            JJ
·1180 DATA0,128,,,128,,,128                        DM
·1190 DATA0,,128,,,128,,.                          PC
·1200 DATA191,,,124,152,,2,84                      LG
·1210 DATA001,63,114,3,35,66,2,165                 OM
·1220 DATA092,2,169,96,2,191,192,2                 AO
·1230 DATA070,,1,58,,1,252,.                       OB
·1240 DATA0,68,,1,200,,1,16                        MA
·1250 DATA0,1,16,,,240,,255                        GH
·1260 DATA0,16,,,16,,,16                           BL
·1270 DATA0,,16,,,16,,.                            ML
·1280 DATA016,,,16,,,124,.                         JL
·1290 DATA001,199,,2,146,128,5,41                  CF
·1300 DATA064,5,69,64,5,125,64,3                   NJ
·1310 DATA069,128,22,170,208,41,125,40             DL
·1320 DATA032,254,8,39,131,200,24,.                GN
·1330 DATA048,,,,,,,.                              MJ
·1340 DATA0,,4,,,8,,.                              KP
·1350 DATA016,,,32,,252,64,25                      JD
·1360 DATA062,128,42,65,,78,252,128                AN
·1370 DATA066,196,192,58,165,64,6,149              EK
·1380 DATA064,3,253,64,,98,64,.                    BG
·1390 DATA092,128,,63,128,,34,.                    LP
·1400 DATA0,19,128,,8,128,,8                       IH
·1410 DATA128,,15,,,,,.                            HF
·1420 DATA0,,,3,128,,4,64                          LH
·1430 DATA0,4,128,,2,92,,2                         GG
·1440 DATA098,,2,189,,3,67,.                       MG
·1450 DATA001,185,128,1,212,128,1,146              PK
·1460 DATA255,1,212,128,1,185,128,3                CG
·1470 DATA067,,2,189,,2,98,.                       HF
·1480 DATA002,92,,4,128,,4,64                      CN
·1490 DATA0,3,128,,,,,36                           BC
·1500 DATA0,15,,,8,128,,8                          FO
·1510 DATA128,,19,128,,34,,.                       AI
·1520 DATA063,128,,92,128,,98,64                   NO
·1530 DATA003,253,64,6,149,64,58,165               CJ
·1540 DATA064,66,196,192,78,252,128,42             EO
·1550 DATA064,128,25,63,128,,252,64                CG
·1560 DATA0,,32,,,16,,.                            ON
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·1570 DATA008,,,4,,,2,255                        HM
·1580 DATA0,,,,,,24,.                            NI
·1590 DATA048,39,131,200,32,254,8,41             PG
·1600 DATA125,40,22,170,208,3,69,128             EB
·1610 DATA005,125,64,5,69,64,5,41                EB
·1620 DATA064,2,146,128,1,199,,.                 AE
·1630 DATA124,,,16,,,16,.                        LL
·1640 DATA0,16,,,16,,,16                         HJ
·1650 DATA0,,16,,,16,,.                          FB
·1660 DATA0,120,,,136,,,136                      BO
·1670 DATA0,,228,,,34,,.                         LL
·1680 DATA254,,,157,,,1,35,.                     EA
·1690 DATA001,95,224,1,84,176,1,82               FG
·1700 DATA174,1,145,161,,159,185,.               KD
·1710 DATA129,42,,254,76,1,31,128                LM
·1720 DATA002,,,4,,,8,.                          KH
·1730 DATA0,16,,,32,,,.                          MF
·1740 DATA0,,,,1,192,,2                          PO
·1750 DATA032,,1,32,,58,64,.                     LI
·1760 DATA070,64,,189,64,,194,192                IL
·1770 DATA001,157,128,1,43,128,255,73            JC
·1780 DATA128,1,43,128,1,157,128,.               DM
·1790 DATA194,192,,189,64,,70,64                 BH
·1800 DATA0,58,64,,1,32,,2                       MJ
·1810 DATA032,,1,192,,,,.                        IF
·1820 DATA064,,,32,,,16,.                        IF
·1830 DATA0,8,,,4,,,2                            JP
·1840 DATA063,,1,252,152,1,2,84                  JO
·1850 DATA001,63,114,3,35,66,2,165               FP
·1860 DATA092,2,169,96,2,191,192,2               KN
·1870 DATA070,,1,58,,1,252,.                     HO
·1880 DATA0,68,,1,200,,1,16                      OD
·1890 DATA0,1,16,,,240,,255                      AC
·1900 DATA028,,56,20,,40,116,.                   BJ
·1910 DATA046,66,,66,121,126,158,4               FD
·1920 DATA129,32,3,,192,2,,64                    FP
·1930 DATA002,129,64,2,231,64,3,.                HI
·1940 DATA064,5,148,224,9,65,80,242              PC
·1950 DATA162,207,132,128,161,244,156,175        FP
·1960 DATA020,65,40,28,62,56,,.                  NO
·1970 DATA0,,,,,,,.                              LE
·1980 DATA0,,,,,,,.                              PG
·1990 DATA0,,4,,,4,,1                            HE
·2000 DATA016,64,,65,,1,81,.                     JF
·2010 DATA004,81,64,4,101,64,1,238               DL
·2020 DATA064,5,171,80,6,255,144,6               KH
·2030 DATA125,144,1,150,64,,85,.                 MI
·2040 DATA0,,,,,,,.                              AK
·2050 DATA0,,,,,,,.                              CB
·2060 DATA0,,,,2,,,64                            IO
·2070 DATA128,,18,64,,17,128,.                   MA
·2080 DATA017,64,,71,64,,213,64                  DJ
·2090 DATA0,87,80,,117,80,1,254                  PH
·2100 DATA208,1,191,144,2,251,208,2              PI
·2110 DATA125,144,1,150,64,,85,.                 AH
·2120 DATA0,,,,,,,.                              IH
·2130 DATA0,,,,,,,.                              HB
·2140 DATA127,60,254,144,195,33,162,203          GM
·2150 DATA005,128,195,65,127,60,254,231          PC
·2160 DATA231,231,154,25,24,24,152,89            KK
·2170 DATA088,58,24,231,231,231,126,255          DL
·2180 DATA126,131,64,197,163,4,129,139           LP
·2190 DATA032,145,131,,129,126,255,126           FB
·2200 DATA231,231,231,90,26,88,24,24             IL
·2210 DATA026,25,24,152,231,231,231,.            KJ
·2220 DATA255,255,255,128,,1,183,255             KK
·2230 DATA237,187,255,221,189,255,189,190        NN
·2240 DATA255,125,191,126,253,191,129,253        CF
·2250 DATA191,129,253,191,129,253,191,129        BD
·2260 DATA253,191,129,253,191,129,253,191        OF
·2270 DATA129,253,191,126,253,190,255,125        FI
·2280 DATA189,255,189,187,255,221,183,255        EB
·2290 DATA237,128,,1,255,255,255,255             NE
·2300 REM INTERRUPT DATA                         HO
·2310 DATA120,169,21,141,20,3                    OI
·2320 DATA169,12,141,21,3,169                    AM
·2330 DATA2,133,251,169,1,133                    JK
·2340 DATA252,88,96,173,242,17                   MJ
·2350 DATA240,2,76,101,250,198                   JO
·2360 DATA251,208,24,169,3,133                   FC
·2370 DATA251,165,252,24,105,93                  HF
·2380 DATA162,2,157,249,31,202                   CP
·2390 DATA208,250,169,1,56,229                   OI
·2400 DATA252,133,252,169,1,56                   EF
·2410 DATA229,252,170,189,0,220                  CI
·2420 DATA170,41,16,240,7,165                    GK
·2430 DATA252,10,72,76,30,13                     EA
·2440 DATA138,41,15,133,253,169                  NG
·2450 DATA15,56,229,253,168,165                  AH
·2460 DATA252,10,72,170,152,201                  EG
·2470 DATA4,208,22,222,214,17                    AE
·2480 DATA208,14,138,74,168,200                  FF
·2490 DATA152,77,230,17,141,230                  ME
·2500 DATA17,222,214,17,76,30                    CA
·2510 DATA13,201,8,208,22,254                    FB
·2520 DATA214,17,208,14,138,74                   OB
·2530 DATA168,200,152,77,230,17                  ME
·2540 DATA141,230,17,254,214,17                  EL
·2550 DATA76,30,13,201,1,208                     LP
·2560 DATA7,232,222,214,17,76                    IM
·2570 DATA30,13,201,2,208,7                      JI
·2580 DATA232,254,214,17,76,30                   MI
·2590 DATA13,201,5,208,26,222                    GG
·2600 DATA214,17,208,14,138,74                   KO
·2610 DATA168,200,152,77,230,17                  OF
·2620 DATA141,230,17,222,214,17                  FB
·2630 DATA232,222,214,17,76,30                   JB
·2640 DATA13,201,6,208,26,222                    EF
·2650 DATA214,17,208,14,138,74                   MI
·2660 DATA168,200,152,77,230,17                  NH
·2670 DATA141,230,17,222,214,17                  GD
·2680 DATA232,254,214,17,76,30                   NM
·2690 DATA13,201,9,208,26,254                    NJ
·2700 DATA214,17,208,14,138,74                   PC
·2710 DATA168,200,152,77,230,17                  DJ
·2720 DATA141,230,17,254,214,17                  FI
```

```
·2730 DATA232,222,214,17,76,30         AF
·2740 DATA13,201,10,208,23,254         GH
·2750 DATA214,17,208,14,138,74         DM
·2760 DATA168,200,152,77,230,17        KL
·2770 DATA141,230,17,254,214,17        CC
·2780 DATA232,254,214,17,104,170       FA
·2790 DATA74,168,200,152,45,230        OH
·2800 DATA17,208,20,189,214,17         NA
·2810 DATA56,205,238,17,176,11         IA
·2820 DATA172,238,17,200,152,157       ED
·2830 DATA214,17,76,126,13,138         EN
·2840 DATA74,168,200,152,45,230        AC
·2850 DATA17,240,17,189,214,17         PN
·2860 DATA56,205,239,17,144,8          IO
·2870 DATA172,239,17,136,152,157       KA
·2880 DATA214,17,232,189,214,17        HD
·2890 DATA56,205,240,17,176,11         MM
·2900 DATA172,240,17,200,152,157       CK
·2910 DATA214,17,76,126,13,189         BN
·2920 DATA214,17,56,205,241,17         OG
·2930 DATA144,8,172,241,17,136         HG
·2940 DATA152,157,214,17,76,101,250    NO
```

PS TO GEOS
FROM PAGE 51

PS TO GEOS.ML

Starting address in hex: C000
Ending address in hex: C570

***Flankspeed* required for entry of PS TO GEOS.ML! See page 79.**

```
C000: BF FF FF FF BB BA B9 BA AA
C008: 93 91 A3 13 91 A2 BA 91 64
C010: 80 00 01 B9 27 9F A1 24 D7
C018: 93 B9 E4 9F 89 24 91 B9 E2
C020: 27 91 80 0C 01 9F FC 01 04
C028: BF FC 01 BC 00 01 9E 7B BD
C030: DD 90 42 51 96 72 5D 92 2B
C038: 42 45 9E 7B DD FF FF FF B7
C040: 83 06 00 00 52 73 56 00 E5
C048: 52 50 53 20 54 4F 20 47 69
C050: 45 4F 53 20 20 56 31 2E 2E
C058: 30 00 00 00 00 53 68 61 A5
C060: 77 6E 20 4B 2E 20 53 6D C0
C068: 69 74 68 00 00 00 00 00 AE
C070: 00 00 00 00 00 00 00 00 70
C078: 00 00 00 00 00 00 00 00 78
C080: 00 00 00 00 00 00 00 00 80
C088: 00 00 00 00 00 00 00 00 88
C090: 00 00 00 00 00 00 00 00 90
C098: 00 00 00 00 43 6F 6E 76 30
C0A0: 65 72 74 20 79 6F 75 72 DD
C0A8: 20 50 72 69 6E 74 20 53 4B
C0B0: 68 6F 70 20 67 72 61 70 C4
C0B8: 68 69 63 73 20 69 6E 74 CD
C0C0: 6F 20 47 45 4F 53 20 66 06
C0C8: 6F 72 6D 61 74 20 77 69 EE
C0D0: 74 68 20 50 53 20 54 6F 55
C0D8: 20 47 45 4F 53 20 2E 20 96
C0E0: 2E 20 2E 20 2E 00 00 00 AB
C0E8: 00 00 00 00 00 00 00 00 E8
C0F0: 00 00 00 00 00 00 00 00 F0
C0F8: 00 00 00 FF 20 9F C1 00 7A
C100: C7 00 00 3F 01 A9 BE 85 F5
C108: 18 A9 00 85 19 A0 6E 38 AF
C110: 20 4E C1 A2 00 20 32 52 87
C118: 20 3E 53 E0 02 F0 0C 8A 34
C120: D0 DA 20 D2 54 20 94 54 1C
C128: 20 52 55 4C 2C C2 8A 0A BF
C130: AA BD 53 52 85 74 BD 54 4A
C138: 52 85 75 A9 4A 85 02 A9 AA
C140: 52 85 03 4C 56 C2 81 0C 0E
C148: 08 1E 74 01 11 48 00 61 9E
C150: 52 81 52 9E 52 AF 52 C4 2E
C158: 52 D9 52 F8 52 18 49 4E D1
C160: 53 45 52 54 20 50 52 49 AB
C168: 4E 54 20 53 48 4F 50 20 86
C170: 47 52 41 50 48 49 43 20 90
C178: 44 49 53 4B 00 18 49 4E 54
C180: 53 45 52 54 20 47 45 4F BB
C188: 53 20 57 4F 52 4B 20 44 A4
C190: 49 53 4B 20 2E 20 2E 20 35
C198: 2E 00 18 46 49 4C 45 20 20
C1A0: 4E 4F 54 20 46 4F 55 4E EB
C1A8: 44 21 00 18 45 52 52 4F 5F
C1B0: 52 20 52 45 41 44 49 4E D7
C1B8: 47 20 46 49 4C 45 21 00 62
C1C0: 18 45 52 52 4F 52 20 57 DB
C1C8: 52 49 54 49 4E 47 20 46 FD
C1D0: 49 4C 45 21 00 18 54 48 81
C1D8: 49 53 20 49 53 20 4E 4F EF
C1E0: 54 20 41 20 47 45 4F 53 E5
C1E8: 20 57 4F 52 4B 20 44 49 FA
C1F0: 53 4B 21 00 18 53 55 43 B4
C1F8: 43 45 53 53 46 55 4C 20 30
C200: 43 4F 4E 56 45 52 53 49 6B
C208: 4F 4E 21 00 18 45 4E 54 C6
C210: 45 52 20 4E 41 4D 45 20 0A
C218: 4F 46 20 46 49 4C 45 20 0F
C220: 4F 52 00 18 50 52 45 53 15
C228: 53 20 52 45 54 55 52 4E 7D
C230: 20 46 4F 52 20 4C 49 53 41
C238: 54 00 20 A1 C2 A9 00 8D 48
C240: 3D 54 A9 3D 85 0C A9 54 48
C248: 85 0D A9 A2 85 02 A9 53 AB
C250: 85 03 20 56 C2 A5 02 C9 83
C258: 02 D0 03 A2 02 60 C9 06 03
C260: F0 D8 AD 3D 54 D0 05 20 5F
C268: B9 53 D0 CE A9 3D 85 0E 8F
C270: A9 54 85 0F 20 8D 53 20 24
C278: 0B C2 8A F0 08 A2 02 20 8E
C280: 32 52 4C 3E 53 20 5E 54 B5
C288: 60 A0 0F B1 0E C9 61 90 14
C290: 09 C9 7B B0 05 38 E9 20 D6
C298: 91 0E 88 10 EE 60 81 0B AC
```

```
C2A0: 10 20 10 53 0B 10 30 27 A6
C2A8: 53 0D 10 3A 0C 10 02 01 72
C2B0: 48 06 11 48 00 A9 12 A2 B6
C2B8: 01 85 04 85 70 86 05 86 4B
C2C0: 71 A9 00 85 FB 85 0A A9 96
C2C8: 80 85 FC 85 0B 20 E4 C1 23
C2D0: A0 02 B1 FB F0 26 C8 B1 B2
C2D8: FB F0 21 A0 1F B1 FB D0 25
C2E0: 1B 88 B1 FB C9 03 B0 14 C3
C2E8: A0 05 B1 FB 99 38 54 C8 2B
C2F0: C0 15 D0 F6 20 14 54 F0 08
C2F8: 03 A2 00 60 18 A5 FB 69 22
C300: 20 85 FB 90 CB AE 01 80 2E
C308: AD 00 80 D0 AC A2 FF 60 B6
C310: A9 24 85 02 A9 54 85 03 EB
C318: 20 56 C2 A5 02 C9 04 60 27
C320: 81 0B 0A 1E 36 54 03 01 63
C328: 48 04 11 48 0B 0A 3C 4E 6D
C330: 54 00 18 46 69 6C 65 3A 58
C338: 20 40 40 40 40 40 40 40 1A
C340: 40 40 40 40 40 40 40 40 42
C348: 40 00 18 55 73 65 20 74 63
C350: 68 69 73 20 66 69 6C 65 57
C358: 3F 00 A9 00 85 10 A9 40 C0
C360: 85 11 A0 1C B1 0C 38 E9 93
C368: 02 29 01 85 72 A0 01 B1 DF
C370: 0C 85 04 C8 B1 0C 85 05 17
C378: A9 00 85 06 A9 03 85 07 E6
C380: 20 FF C1 60 50 68 6F 74 5F
C388: 6F 20 53 63 72 61 70 00 13
C390: 20 A2 54 A9 88 85 02 A9 0B
C398: 54 85 03 4C 38 C2 A2 01 60
C3A0: 20 32 52 20 A1 C2 AD 8B 03
C3A8: 84 F0 01 60 A2 05 20 32 79
C3B0: 52 4C A2 54 06 30 00 0C 88
C3B8: 00 0B 38 00 16 00 06 00 18
C3C0: 24 BF 00 16 00 4D BF 00 C7
C3C8: 00 05 06 0B 2D 34 A4 72 57
C3D0: B9 CE 54 85 7B B9 D0 54 8D
C3D8: 85 7C B9 CC 54 85 7D A9 62
C3E0: 00 8D BB 55 85 76 A9 45 6A
C3E8: 8D BC 55 85 77 A9 02 85 B6
C3F0: 78 A9 40 85 79 A4 7D A2 17
C3F8: 04 B9 B8 54 20 43 55 C8 45
C400: CA 10 F6 A6 7C A5 7B 18 2E
C408: 69 80 20 43 55 A4 7B 84 4F
C410: 7A A0 00 B1 78 20 43 55 0E
C418: E6 78 D0 02 E6 79 A4 7A C9
C420: 88 D0 EC CA D0 DF A4 7D 04
C428: A2 04 B9 C2 54 20 43 55 58
C430: C8 CA 10 F6 A5 76 8D BD 32
C438: 55 A5 77 8D BE 55 60 84 31
C440: 73 A0 00 91 76 E6 76 D0 8A
C448: 02 E6 77 A4 73 60 A9 74 3F
C450: 85 14 A9 55 85 15 A9 00 2D
C458: 85 16 20 ED C1 8A D0 06 25
C460: A2 06 4C 32 52 60 A2 04 E0
C468: 20 32 52 68 68 4C 00 52 7C
C470: 88 54 03 15 BF FF FF FF 25
C478: 80 40 01 80 60 01 80 60 FC
C480: 01 80 60 0D 80 50 35 80 F5
C488: 50 D9 80 53 21 80 5C C1 46
C490: 80 59 01 87 CE 01 9F C8 2B
C498: 01 B8 F8 01 B1 FC 01 BF BB
C4A0: 6E 01 9C 66 01 80 66 01 FB
C4A8: 80 6C 01 80 38 01 80 00 D0
C4B0: 01 FF FF FF 83 04 00 00 39
C4B8: 70 00 53 00 00 50 68 6F A4
C4C0: 74 6F 20 53 63 72 61 70 BF
C4C8: 20 56 31 2E 31 00 00 00 CF
C4D0: 00 50 68 6F 74 6F 20 53 50
C4D8: 63 72 61 70 00 00 00 00 80
C4E0: 00 00 00 00 00 00 00 00 E0
C4E8: 00 00 00 00 00 00 00 00 E8
C4F0: 00 00 00 00 00 00 00 00 F0
C4F8: 00 00 00 00 00 00 00 00 F8
C500: 00 00 00 00 00 00 00 00 00
C508: 00 00 00 00 00 00 00 00 08
C510: 00 00 00 00 00 00 00 00 10
C518: 00 00 00 00 00 00 00 00 18
C520: 00 00 00 00 00 00 00 00 20
C528: 00 00 00 00 00 00 00 00 28
C530: 00 00 00 00 00 00 00 00 30
C538: 00 00 00 00 00 00 00 00 38
C540: 00 00 00 00 00 00 00 00 40
C548: 00 00 00 00 00 00 00 00 48
C550: 00 00 00 00 00 00 00 00 50
C558: 20 53 48 41 57 4E 20 4B 66
C560: 2E 20 53 4D 49 54 48 20 55
C568: 2D 20 41 48 4F 59 21 20 29
C570: 00 70
```

BINARY TO GEOS

```
·100 REM* BINARY TO GEOS V1.0 FROM AHOY!! JO
·110 REM* (E)NGENDERED BY  SHAWN K. SMITH JO
·120 PN$="PS TO GEOS":DATA 000,006,087,00
 3,008,004,030                           HA
·130 FORD=1TO16:P$=P$+CHR$(160):NEXT     FE
·140 PN$=MID$(PN$+P$,1,16):Z$=CHR$(0)    FH
·150 FORD=1TO7:READ DI(D):NEXT           HF
·160 PRINTCHR$(147):PRINT:PRINT          IC
·170 INPUT"ENTER NAME OF BINARY FILE";B$ HE
·180 OPEN1,8,15,"I0":OPEN8,8,8,B$+",P,R" PE
·190 GOSUB220:GOSUB250:GOSUB390          IO
·200 PRINT:PRINTCHR$(18)PN$" CONVERTED!" OD
·210 CLOSE8:CLOSE1:END                   GM
·220 INPUT#1,E,E$,A$,A$:IFE=0THENRETURN  CH
·230 PRINT:PRINT"[3"*"]";E;E$;" [3"*"]"  GK
·240 CLOSE8:CLOSE1:END                   IK
·250 PRINT:PRINT"WORKING . . .":PRINT    FP
·260 T=18:S=1:CLOSE8:OPEN8,8,8,+"#"      HP
```

```
·270 PRINT#1,"U1"8;0;T;S:GOSUB220         LA
·280 PRINT#1,"B-P"8;0:GET#8,NT$,NS$        LI
·290 FORTB=2TO228STEP32:DN$=""             DL
·300 PRINT#1,"B-P"8;TB:GET#8,FT$,TD$,SD$   LI
·310 IFASC(FT$+Z$)<>130THEN350             GP
·320 FORD=1TO16:GET#8,N$:DN$=DN$+N$:NEXT   DN
·330 PRINTDN$,                             LM
·340 IF DN$=MID$(B$+P$,1,16)THEN RETURN    GB
·350 NEXT:T=ASC(NT$+Z$):S=ASC(NS$+Z$)      JB
·360 IF T THEN270                          IM
·370 PRINT"[3"?"] FILE NOT FOUND!"         MB
·380 CLOSE8:CLOSE1:END                     BF
·390 PRINT#1,"U1"8;0;ASC(TD$)ASC(SD$)      MG
·400 PRINT#1,"B-P"8;0:GET#8,T2$,S2$        BA
·410 PRINT#1,"B-P"8;0:PRINT#8,CHR$(0)CHR$
 (255)CHR$(3)CHR$(21);                     CG
·420 PRINT#1,"U2"8;0;ASC(TD$)ASC(SD$)      AF
·430 PRINT#1,"U1"8;0;T;S:PRINT#1,"B-P"8;T
 B:PRINT#8,CHR$(131);T2$S2$PN$TD$SD$;      IK
·440 FORD=1TO7:PRINT#8,CHR$(DI(D));:NEXT   JB
·450 PRINT#1,"U2"8;0;T;S                   EF
·460 RETURN                                FL
```

CHAINMAIL

Continued from page 70

scream.

As long as the other player is still in contact with you, he will not lose his balance and fall into the shaft. This makes it easy to push your enemy razor-close to the shaft, then pull free and watch him tumble in. Just make sure it is not he who pulls free and watches you tumble in!

Swordplay has many variations. You can lock your sword into place and execute the forward charge. When we were debugging the game, my friend developed an interesting technique of locking his sword out and spinning in place. Whenever I tried to approach him, I was struck with several blows. You can also try striking, rotating to cause a blow to glance off, and rotating back and striking your enemy again. Another method is to strike, pull back out of range, wait for your opponent's sword to swish by harmlessly, and plunge forward with a blow again. It takes a great deal of practice to execute any of these techniques.

Once you get the other knight at a disadvantage, he'll probably lose his nerve and break for one of the healing fires. Don't let him reach it. If possible, interpose yourself between him and the nearest escape route. If he rotates away to protect himself from your blows, begin shoving him towards one of the shafts.

Chainmail! is a simple yet fiercely competitive game with superb graphics. I consider it my finest offering yet in the way of arcade games for the C-128. Please enjoy it, and feel free to write me with any complaints, requests, etc., c/o *Ahoy!*

Since there are a lot of data statements, make sure you save one or two copies to disk before running the program, in case a typing error crashes it. It's a lot easier to look through the listing and find a single error than to type the whole thing over again. □

SEE PROGRAM LISTING ON PAGE 91

TIPS AHOY!

Continued from page 47

```
·5050 PRINT"[CLEAR]PRESS <SHIFT> TO PAUSE
  <[BACKARROW]> TO EXIT":GET#2,B$,C$
·5060 IFPEEK(197)=57THEN5170
·5070 IFPEEK(653)=1THEN5070
·5080 GET#2,Z$,B$,C$,D$:IFZ$=""ANDB$=""TH
 EN5170
·5090 V$=STR$(ASC(C$+O$)+ASC(D$+O$)*256)+
 " ":V$=MID$(V$,2):PRINT:PRINTV$;:Q=0
·5100 GET#2,C$:C=ASC(C$+O$):IFC=0THEN5060
·5110 IFC>127ANDC<204ANDQ=0THENPRINTT$(C-
 127);:GOTO5100
·5120 IFC=34THENQ=1-Q
·5130 PRINTCHR$(C);:GOTO5100
·5140 GET#15,N:IFN=0THENRETURN
·5150 IFN=6THENPRINT"[DOWN][DOWN]PROGRAM
 NOT ON THIS DISK":FORK=1TO2000:NEXT:RUN
·5160 PRINT"[DOWN][DOWN]DISK ERROR. PROGR
 AM ABORTED
·5170 CLOSE15:POKE198,0
```

EXPLODED CHARACTERS

When designing programmable characters (such as some German, French, Spanish, or Turkish letters), the task at hand is usually just a slight modification of an English character which is already available from the keyboard. Therefore the exploded view of a keyboard letter may give good guidance as to how the modified version of that letter should be designed as a programmable character.

The user responds to the INPUT prompt by typing a character and pressing RETURN. The program gives an exploded (64 times larger) view of that character. For lower case characters replace the value 53248 in line 35 with 55296.

—Necah Buyukdura
Ankara, Turkey

```
·10 POKE 52,48: POKE 56,48: CLR
·15 B$="[8" "]"
·16 M$=CHR$(147):H$=CHR$(19):R$=CHR$(18):
 O$=CHR$(146):D$=CHR$(17)
·20 PRINT M$D$D$D$D$" "R$B$"  "
·25 FOR J=1 TO 8: PRINT" "R$" "O$B$R$" ":
 NEXTJ: PRINT" "R$B$"  "
·30 PRINT H$D$B$B$: PRINT B$B$
·35 PRINT H$D$;: INPUT " CHARACTER ";C$:C
 H=PEEK(1077)*8+53248
·40 POKE 56334,PEEK(56334)AND254:POKE1,PE
 EK(1)AND251
·45 FOR I=0 TO 7:A(I)=PEEK(CH+I): NEXTI
·50 POKE 1,PEEK(1)OR4
·55 POKE56334,PEEK(56334)OR1
·60 PRINT H$D$D$D$D$: FOR X=0 TO 7: X$=""
·65 FOR Y=7 TO 0 STEP -1
·70 IF A(X)>=2[UPARROW]Y THEN X$=X$+CHR$(
 113): A(X)=A(X)-2[UPARROW]Y:GOTO 80
·75 X$=X$+" "
```

```
•80 NEXT Y: PRINT CHR$(158)TAB(2)X$: NEXT
X: GOTO 30
```

QUICKER TRIG FUNCTIONS

One of the problems with standard Commodore BASIC is its slow speed—especially when trigonometric functions are involved. It takes about 0.26 milliseconds for a sine or cosine value to be calculated. This may not seem like a lot of time, but when the functions are used repeatedly, it can slow down a program's execution considerably. (Also, the values must be calculated in radian measure, not degrees—an annoying quirk.)

The following program demonstrates the slow speed of BASIC 2.0 using trig functions, by animating an orbitting sprite:

```
•100 REM DEFINE SPRITE
•101 V=53248
•102 FORI=832TO832+63:POKEI,255:NEXT
•103 POKE2040,13:POKEV+21,1:POKEV+39,1
•120 REM PUT SPRITE IN ORBIT
•140 FORX=0TO2*[PI]STEP[PI]/180
•141 POKEV,165+90*COS(X):POKE V+1,140+90*
SIN(X)
•142 NEXT:GOTO 140
```

The trig functions, sine and cosine, were bogging down the animation speed because the functions' values must be calculated each time. If, however, the trig functions were precalculated and stored in an array, then run time would be much quicker, and degrees could be used instead of radians as an argument. Just add these lines to increase program speed:

```
•110 REM PRECALCULATE SINE, COSINE
•112 DIM SN(360),CS(360):FORD=0TO360:SN(D
)=SIN(D*[PI]/180):CS(D)=COS(D*[PI]/180):
NEXT
•140 FORX=0TO360
•141 POKEV,165+90*CS(X):POKE V+1,140+90*S
N(X)
```

Note that we have changed the functions, sin( ) and cos( ), to the variables sn( ) and cs( ).

After a 30 second pause for sine and cosine precalculation, you will see a 300% improvement in speed! This simple precalculation trick can be applied to other functions as well, and will make your programs run much more speed-efficiently—without complicated machine language!

—Andrew Vajoczki
Brantford, ONT

SENSORS ON

Disk Notch Sensor is a short C-64/128 BASIC program that will inform you whether a disk's notch (the small rectangular hole on the disk) is covered by a write-protect tab or uncovered. This program works with a C-64/128 and a 1541 or 1571 disk drive.

To use the program, just turn on your disk drive and computer. Then run this program and insert a disk in the drive. It will quickly and safely tell you if your disk is physically write-protected.

You can easily modify this program to your own needs. Let's say you have a program that saves information on the disk. Just slightly modify *Disk Notch Sensor* and add it as a routine to the program. Then the program can check to see if the disk is not physically write-protected before it saves something on the disk.

You should be able to find many other uses for *Disk Notch Sensor*.

—Nghia Tran
Petaluma, CA

```
•10 REM *** DISK NOTCH SENSOR ****
•20 REM *** AUTHOR: NGHIA TRAN ***
•21 PRINT"[CLEAR]PRESS ANY KEY TO CHECK D
ISK"
•22 GET A$
•23 IF A$="" THEN 22
•30 OPEN15,8,15:PRINT"[CLEAR][WHITE]"
•40 PRINT#15,"M-R"CHR$(30)CHR$(0)
•50 GET#15,K$
•60 N=ASC(K$+CHR$(0))
•70 IF N=16THEN 100
•90 PRINT"[CLEAR][RVSON]DISK'S NOTCH IS[G
REEN] WRITE-PROTECTED[RVSOFF]":GOTO110
•100 PRINT"[CLEAR][RVSON]DISK'S NOTCH IS[
c 1] NOT PROTECTED[RVSOFF]"
•110 PRINT"[3"[DOWN]"][WHITE]PRESS [RVSON
]R[RVSOFF] TO RE-CHECK OR [RVSON]Q[RVSOF
F] TO QUIT."
•120 GET I$
•130 IF I$="" THEN 120
•140 IF I$="R" THEN 40
•150 CLOSE15:END
```

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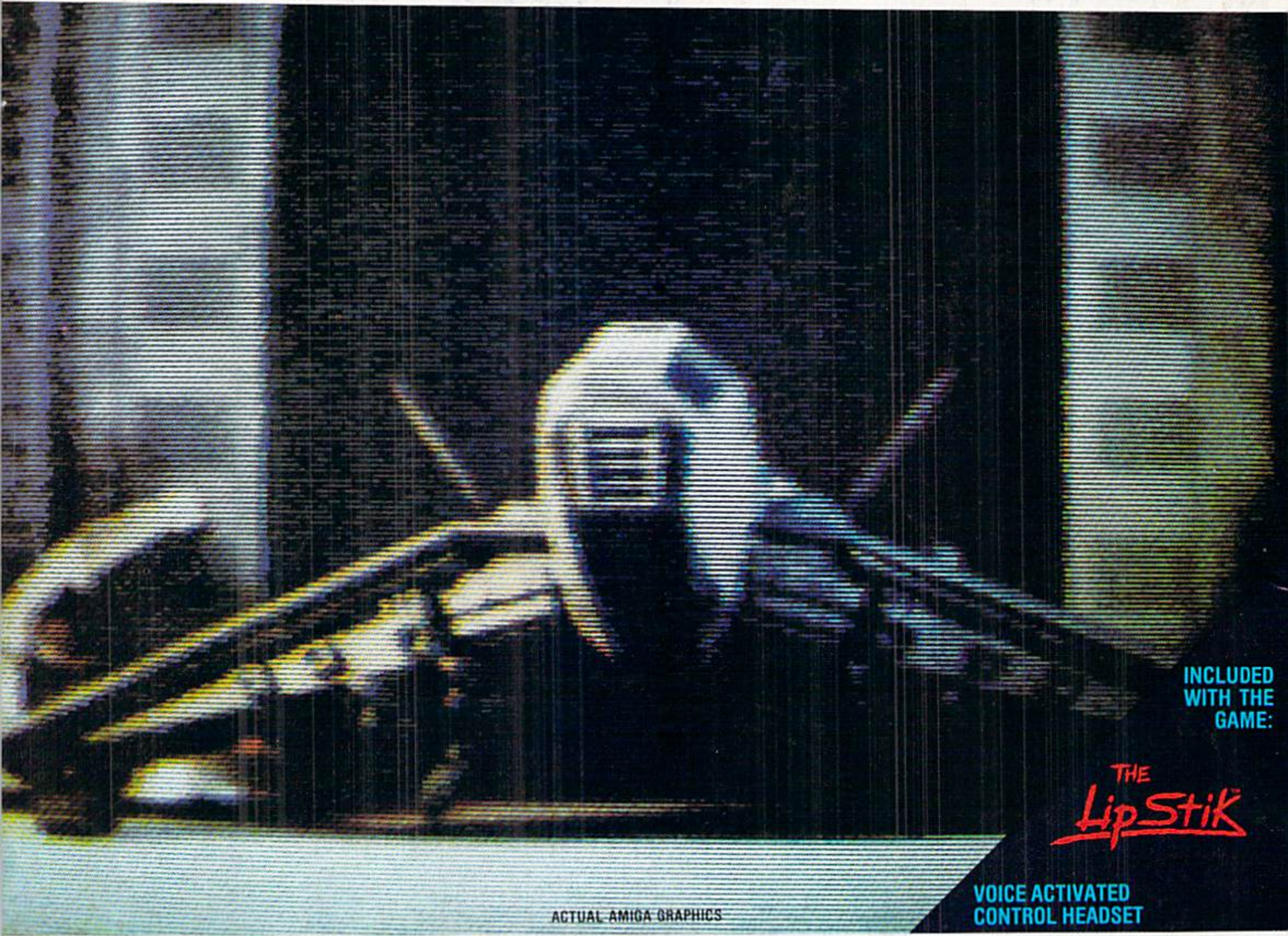
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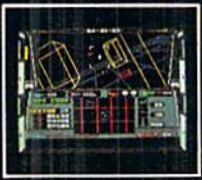


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